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MANUAL OF GYNECOLOGY

"With the Authors' Compliments"

MANUAL

OF

GYNECOLOGY

BY

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TO

OUR FRIEND AND TEACHER

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PREFACE TO THE SIXTH EDITION.

WHILE keeping especially in view recent developments in Operative Gynecology, we have, in preparing this edition, revised the whole text carefully, and brought it up to date.

Many new illustrations have been added.

We are indebted to Dr W. Fordyce and Dr B. P. Watson for their valued help in preparing this edition for the press.

D. BERRY HART.
A. H. FREELAND BARBOUR.

EDINBURGH, September 1904.

PREFACE TO FIRST EDITION.

IN writing this Manual we have tried to keep before our eyes the great principle that the Anatomy, Physiology, and Pathology of the Pelvic Organs form the foundation of good Clinical work. As students we felt the want of a text-book based on this principle and embodying the most recent views from the various literatures instead of giving those of one school. This want we have endeavoured to supply.

Our thanks are due to Professor Simpson for his kind advice in matters of difficulty: and specially to Mr J. A. Melville, for the literary revision of the text and the preparation of the copious Table of Contents and Indexes.

Messrs W. & A. K. Johnston have executed the lithographs with their well-known accuracy and finish: and to Mr James Bayne we are indebted for the care and fidelity with which he has drawn on the wood the majority of the engravings. We have in all cases acknowledged the source of every illustration not specially prepared for this work.

D. BERRY HART.
A. H. FREELAND BARBOUR.

EDINBURGH, July 1882.

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Sectional anatomy.
Anatomy—microscopic.
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Pathology—microscopic.
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PART I.

ANATOMY, PHYSIOLOGY, AND METHODS OF EXAMINATION OF THE FEMALE PELVIC ORGANS.

Section I. Anatomy and Physiology of the Female Pelvic Organs.
,, II. Physical Examination of the Female Pelvic Organs.

SECTION I.

ANATOMY AND PHYSIOLOGY OF THE FEMALE PELVIC ORGANS.

IN order to give a comprehensive idea of the Anatomy and Physiology of the Female Pelvic Organs, it will be advisable to consider them in the following manner.

CHAPTER I. General Anatomy of External Genitals and Contents of Pelvis.

,, II. The Sectional Anatomy of the Female Pelvis.

,, III. The position of the Uterus and its Annexa, and the Relation of the Superjacent Viscera.

,, IV. The Structural Anatomy of the Pelvic Floor.

,, V. The Blood-Vessels, Lymphatics, and Nerves of the Pelvis. Development of Pelvic Organs.

,, VI. Physics of the Abdomen and Pelvis, with special reference to the Semiprone, Genupectoral and Trendelenburg Postures.

,, VII. Ovulation and Menstruation.

CHAPTER I.

GENERAL ANATOMY OF EXTERNAL GENITALS AND CONTENTS OF PELVIS.

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EXTERNAL GENITALS AS OBSERVED CLINICALLY.

External Genitals.

UNDER the term external genitals are comprised the structures known as Labia Majora, Fourchette, Labia Minora, Clitoris with its prepuce, Vestibule, and Fossa Navicularis. For clinical convenience the urethral orifice and hymen also are described with these; although the urethral orifice belongs to the urinary system, and the hymen separates anatomically the external genitals (vulva) from the vagina.

Labia Majora.

The *Labia Majora* (fig. 1, *a*) are two thick folds of hair-clad skin, extending from the symphisis pubis backwards between the thighs, and meeting each other nearly in the middle line and about 2·7 cm. (1 inch) in front of the anus; their blunted posterior ends can be seen most distinctly in the fœtus. Each labium has an outer and inner surface, and consists of a thick fold of skin enclosing a quantity of fat, blood-vessels, and dartos. Superiorly, where they are best developed, they form by their junction—anterior commissure—the structure known as the mons veneris (*vide* fig. 1); while posteriorly they stop short of the fold of skin known as the *Fourchette* or posterior commissure. The fat and connective tissue are almost entirely wanting at the fourchette, which is not a distinct structure, but the posterior junction of the thinned-out labia minora. Both labia majora are, in the adult, covered with crisp hair which is abundant over the mons veneris and outer surface but very much less so on the inner.

Labia Minora.

The *Labia Minora* (fig. 1, *b*) are two small oblique folds of hairless skin, one on the inner surface of each labium majus. Posteriorly each is lost in the labium majus at about its middle, while anteriorly they converge and each divides into two small branches—an upper and a lower. The upper branches meet to form the prepuce of the clitoris (fig. 1, *e*), while the lower in a similar way form its suspensory ligament. As a rule the labia minora do not, in the adult, project beyond the labia majora. Sebaceous glands are present on both labia. Microscopically

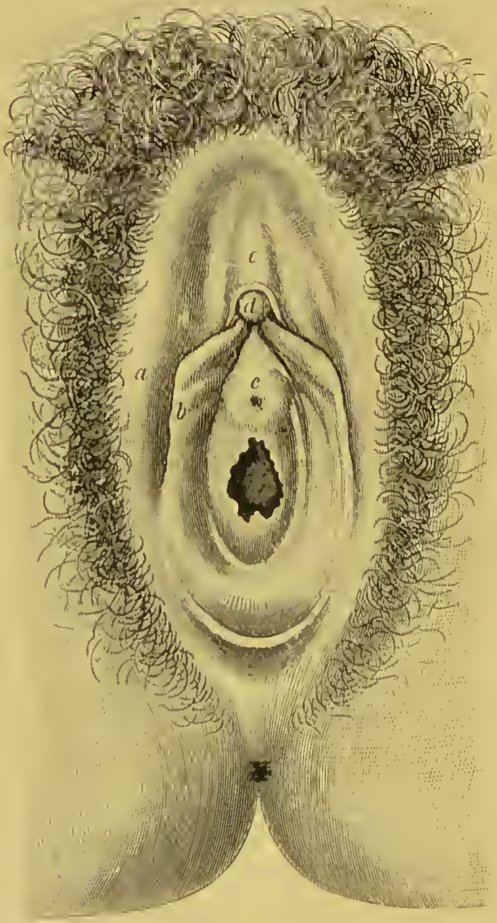


FIG. 1.

EXTERNAL GENITALS OF VIRGIN, with Diaphragmatic Hymen. The Labia Majora and Minora are drawn apart, and the prepuce drawn back. The cadaver is in the lithotomy posture. (Modified from *Sappey*.)

a Labium majus; *b* Labium minus; *c* Vestibule just above urethral orifice; *d* Glans clitoridis; *e* Praeputium clitoridis; *f* Mons veneris. (½) the labia minora have the structure of skin, enclosing fibro-elastic tissue, a venous plexus, nerves, and lymphatics; nerve end organs are found in them and in the glans clitoridis. As above stated, the labia minora may be continued into the fourchette.

Clitoris.

The *Clitoris*, covered by its prepuce, lies in the middle line and at the apex of the smooth piece of mucous membrane known as the vestibule Only that part analogous to the glans penis is seen (fig. 1, *d*). The clitoris proper consists of two crura which arise from the rami of the ischium and pubes and unite superiorly to form the body of the clitoris, which lies beneath the mucous membrane. The glans clitoridis is not directly continuous with the body, but joins it through the pars intermedia of the bulb (*vide post*, p. 12).

Vestibule.

The *Vestibule* (fig. 1, *c*) is a triangular smooth mucous surface bounded superiorly by the clitoris, laterally by the labia minora, and inferiorly by the upper margin of the vaginal orifice. In the middle line, at its base, the dimple of the urethral orifice can be distinctly felt 1 inch (2–2·5 cm.) in front of the fourchette. Small depressions and mucous glands open on its surface. It is covered with a multiple squamous epithelium.

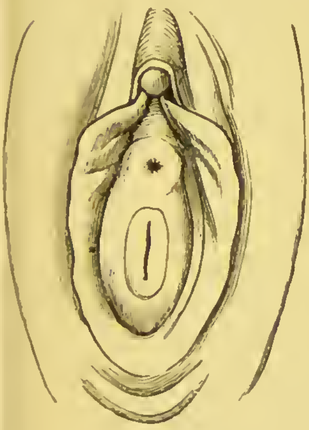


FIG. 2.

HYMEN OF VIRGIN, with Vertical Slit. (1/1)

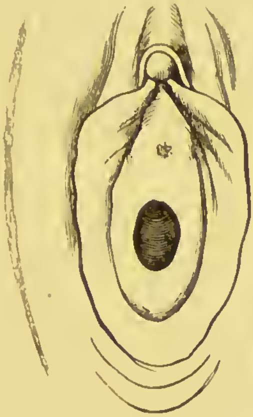


FIG. 3.

HYMEN with Oval Opening. (1/1)

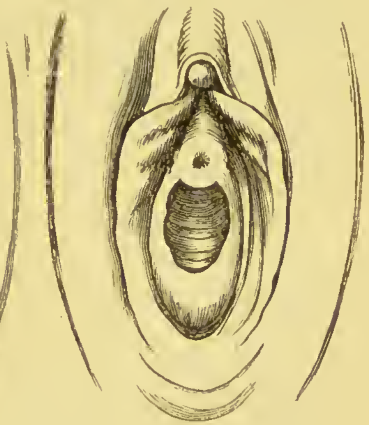


FIG. 4.

CRESCENTIC HYMEN. (1/1)

Vaginal Orifice.

The *Vaginal Orifice* lies in the middle line between the base of the vestibule and the fossa navicularis. Its orifice is guarded by the *hymen*, a thin fold of mucous membrane enclosing some connective tissue, blood-vessels, and nerves (?). The hymen is usually described as being crescentic in shape, attached to the posterior margin of the vaginal orifice and with a free edge towards the base of the vestibule (fig. 4); or diaphragmatic, attached all round the vaginal orifice but with a small hole (figs. 1 and 3) or vertical slit (fig. 2) in it. Sometimes it is not so perforated, constituting a pathological condition. It must be noted however, that if the hymen be examined clinically without disturbing its relations, it will be found to surround a vertical slit, the varying shapes of which, as seen in figs. 3 and 4, can only be recognised on separation of the edges. (*Farre, Cullingworth.*)

The point as to whether the Hymen belongs developmentally to the external genitals or vagina is disputed. Budin believes that the hymen is simply the thinned-out inferior margins of the anterior and posterior vaginal walls. One specimen we have examined certainly supports his statement that the vaginal columns run on the inner aspect of the hymen. Matthews Duncan has pointed out the interesting fact that in atresia vaginæ the hymen may be present—*i.e.*, may be present although the vaginal walls are absent. More recently Pozzi has described cases of mal-development of the sexual organs, and brought out some interesting facts. One case was that of a male hypospadiac with external genitals simulating a female type—*i.e.*, with a pseudo-vulva, a distinct hymen, and a fourchette. Pozzi found a ridge passing from the base of the glans penis, encircling the meatus urinarius and becoming continuous with the hymen: this he terms the male vestibular band. In a female with atresia vaginæ he found a similar band passing from the clitoris, surrounding the urethral orifice, and blending with the hymen. He advances the view that the hymen is vulvar in its origin, and alleges that in women the "male vestibular band" can be seen on careful examination. In the hypospadiac already described this band was the remnant of the *corpus spongiosum*, so that he believes the hymen to be the analogue of the bulb in man.

Ballantyne and Sutton support the view that the hymen is vulvar in its origin. Ballantyne has also confirmed Pozzi's view (*vide* development of organs, p. 73, for fuller discussion).

Fossa Navicularis.

Fossa Navicularis.—Normally, the inner aspect of the fourchette is in contact with the outer and lower surface of the hymen. When the fourchette is pulled back by the finger, a boat-shaped cavity is made—the fossa navicularis. Its posterior boundary is, therefore, the inner aspect of the fourchette; its anterior is the external aspect of the hymen. These two are in contact unless artificially separated.

From behind forwards, in the female ano-vulvar region there lie in the middle line the following structures:—

(1.) Anus.
(2.) Skin over base of Perineal Body.
(3.) Fourchette.
(4.) Fossa Navicularis.
(5.) Vaginal orifice, with Hymen or its remains.
(6.) Urethral orifice.
(7.) Vestibule.
(8.) Clitoris with its prepuce.

Laterally, we have the labia majora and minora.

The following points should be carefully noted. In the nude erect female only the mons veneris is seen, and the labia majora and minora lie in a plane nearly parallel to the horizon. The well-developed labia majora have their inner surfaces always in contact, and are only slightly separated by the widest divergence of the knees. The labia minora are always in contact, and require to be artificially separated in order to see their inner surfaces. The untouched fourchette forms a U-shaped loop, with the limbs of the loop in contact by their inner edges. The fossa navicularis only exists when artificially opened up, and therefore, to see the external genitals fully, the labia must be separated and the prepuce and fourchette drawn back.

A line running as follows separates mucous membrane from skin. Starting from the base of the inner aspect of the right labium minus, it passes *down* beside the base of the outer aspect of the hymen, *up* along the base of the inner aspect of the left labium minus, *in* beneath the prepuce of the clitoris, and *down* to where it first started from.

The vulvar slit is sagittal, and lies in the middle line between the labia majora and minora.

Hymen.

The virginal vaginal orifice is also a vertical slit, only exists as an opening when artificially made, and is anatomically defined by the hymen which separates the external genitals from the internal genitals. The sharp line between skin and mucous membrane can be distinctly seen on the living subject. The labia minora are skin, thin and fine, and not mucous membrane as often alleged.

The following measurements by Foster are useful for reference :—

	Tip of Coccyx to Anus.	Anus to Fourchette.
Average distance in nulliparæ, . .	4·5 cm. . .	2·7 cm.
,, ,, multiparæ, . .	4·7 cm. . .	2·5 cm.

Meatus urinarius, 2—2·5 cm. from fourchette, in nulliparæ ; 2—3·1 cm., in women who have borne children.

In a healthy woman who has experienced complete coitus, the hymen is torn or often only stretched. It admits two fingers without pain. In a woman who has borne full-time children, the vaginal orifice is always torn, although the fourchette and all behind it may be intact. The carunculæ myrtiformes are properly the remains of the hymen. In addition, the passage of the child's head may cause tears of the posterior vaginal wall, perineal body, or even anterior wall of anus.

THE PELVIC FLOOR AND ORGANS RESTING ON IT CONSIDERED AS A WHOLE.

The outlet of the bony female pelvis is filled in by what is generally described as the "soft parts." This term, however, should not be employed, as it is misleading, especially in obstetrics. It is better named the pelvic floor or pelvic diaphragm.

Pelvic Floor.

The pelvic floor is a thick fleshy elastic layer, dovetailed all round to the bony pelvic outlet (fig. 5). It may be considered as an irregularly-edged segment of a hollow sphere, with an outer *skin* aspect and an inner *peritoneal* one. On the outer skin aspect lie the external genitals already described. On the inner peritoneal surface we have the organ known as the uterus, and its appendages the Fallopian tubes and ovaries. The vagina runs, in the erect female, at an angle of about 60° to the horizon, from the vaginal orifice upwards to the mouth of the womb, as a transverse slit in the pelvic diaphragm. In front of the vagina lies the bladder, while behind it the rectum is placed; these structures, along with muscles, connective tissue, blood-vessels, nerves, and lymphatics, making up the pelvic diaphragm.

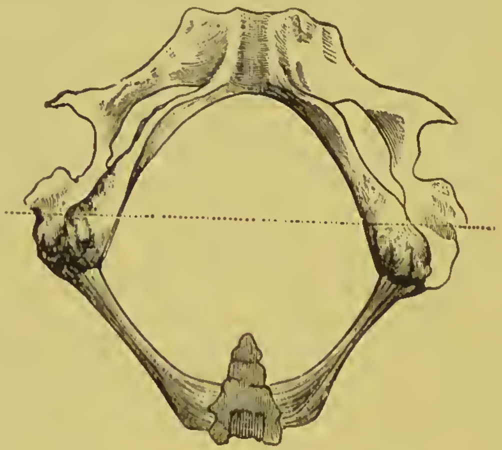


FIG. 5.

BONY PELVIC OUTLET, with transverse line showing Rectal and Urethral Triangles (*D. J. Cunningham*). (¼)

Figure 1 shows, accordingly, the pelvic floor seen from its convex, skin aspect; fig. 37 gives it and the organs resting on it as viewed from its concave, peritoneal side; while fig. 29 displays it as seen in sagittal mesial section.

THE PELVIS CONSIDERED IN DETAIL.

PELVIC FLOOR DISSECTED FROM BELOW.

If a female cadaver be placed in the lithotomy posture and a transverse line drawn just in front of the ischial tuberosities, the perineal region will be divided into a posterior rectal triangle and an anterior urethral one (fig. 5). The former contains the anus, the latter the external genitals.

The fascia of the pelvic floor and its relations demand a few words here.

(1.) *The superficial fascia.*
(2.) *The deep layer of the superficial fascia.*
(3.) *The triangular ligament in two layers.*

(1.) *The superficial fascia* lies beneath the skin, and is simply the continuation over the pelvic floor of the general superficial fascia of the body.

(2.) *The deep layer of the superficial fascia* has the following attachments:—Laterally and above, it is joined to the pubic arch; while posteriorly it passes round the transverse perineal muscles to join the base of the anterior layer of the triangular ligament. If air be injected beneath this deep layer, its passage is limited by the attachments given, and a sac is made—the pudendal sac. Into this sac an inguinal hernia may push its way, and in it the round ligaments of the uterus end.

(3.) *The triangular ligament* consists of two layers of fascia, filling in the pubic arch. They are termed anterior and posterior. The following table may be omitted at present until the whole anatomy is mastered.

Between skin and superficial fascia.	Supfl. hæmorrhoidal vessels and nerves. Supfl. perineal artery and nerve.
Between deep layer and superficial fascia and anterior layer of triangular ligament.	Transversus perinei. Bulbo-cavernosus. Erector clitoridis. Transverse perineal blood-vessels and nerves. Venous plexuses. Bulbs of vagina. Pudendal sacs. Dorsal artery and vein of clitoris.
Between the layers of the triangular ligament. (v. also p. 13).	Compressor urethræ. Vagina—in part. Urethra—in part. Pudic vessels and nerves.

Ischio rectal Fossa.

By suitable incisions the skin and superficial fascia can be removed around the anus, and the ischiorectal fossa defined. This is a small pyramidal cavity on each side of the rectum, bounded externally by the obturator internus muscle, internally by the levator ani. Its apex is formed by the junction of these muscles, while its base is partially

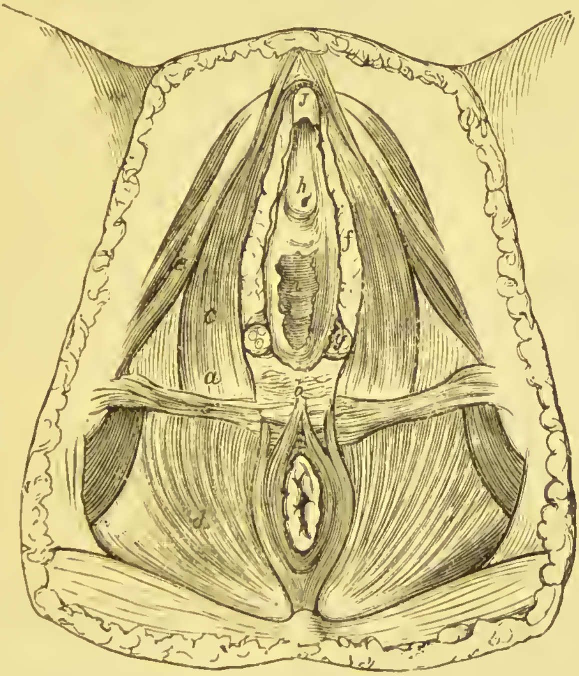


Fig. 6.

Dissection of Perineal Region (*Savage*)

a is just above Transversus Perinei; *b* Base of Perineal body; *c* Bulbo-cavernosus; *d* lies on Levator Ani and in Ischiorectal Fossa; *e* Erector Clitoridis; *f* Bulb of Vagina; *g* Bartholinian Gland; *h* Vestibule; *j* Glans Clitoridis. (½) closed in by the transversus perinei and the edge of the gluteus maximus muscle (fig. 6). If axial-transverse sections of the fossa be made, we see that it is merely the passage of the subcutaneous fat between the gluteus maximus, levator ani, and obturator internus muscles. The gluteus maximus forms the posterior and inferior boundary.

On transverse sections from before backwards it can be noted that its boundaries vary. At the level of the ischial tuberosity it is bounded as follows: inside, levator ani; outside, lower half of obturator internus; while the gluteus floors it in incompletely. About an inch posterior to the tuberosity, we find the boundaries change as follows: inside, we have still the levator ani; outside, a small portion of the obturator internus; while the gluteus maximus floors it in completely. At the posterior margin of the fossa, the levator ani is the inner and upper boundary, the gluteus maximus the outer and lower, the fossa here being quite below the level of the obturator internus.

If the skin and superficial fascia be now removed from the urethral triangle, the following muscles, etc., will be exposed (fig. 6).

Muscles beneath superficial fascia (deep layer).

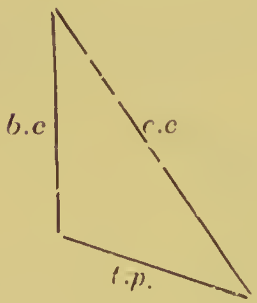


FIG. 7.

Perineal muscles.—On each side of the vaginal orifice three muscles lie, viz., the bulbo-cavernosus (fig. 7, *b c*), erector clitoridis or ischio-cavernosus (fig. 7, *e c*), and transversus perinei (fig. 7 *t p*).

The *Bulbo-cavernosi* consist of two muscular slips, one on each side of the vaginal orifice, which spring behind from the perineal body and pass round the vaginal orifice, partially covering the bulb and the vagina (fig. 6, *c*). The anterior end of each slip splits into three portions which end as follows: One passes to the under surface of the corpus cavernosum of the clitoris, a second goes to the posterior surface of the bulb, and a third blends with the mucous membrane between the clitoris and urethral orifice (*Henle*).

The *Erector Clitoridis* arises from the inside of the ischial tuberosity and is inserted into the back and sides of the crus clitoridis.

The *Transversus Perinei* arises from the ramus of the ischium, and passes to the perineal body. It is difficult to define practically in dissection (fig. 6, *a*).

Now that these muscles have been described, we are in a position to localise more important structures.

Bulbi Vaginæ.

The *Bulbi Vaginæ* (corpora cavernosa urethræ) are small masses of erectile tissue about the size of a bean, lying one on each side of the vaginal orifice and partly under cover of the bulbo-cavernosus muscle. Each rests on the triangular ligament, and has internally the mucous membrane of the vagina; while, as already said, they are partly covered by the bulbo-cavernosus muscle. Anteriorly each blends with its fellow, and this *pars intermedia* becomes continuous with the clitoris (fig. 6, *f*).

Bartholinian Glands.

The *Bartholinian Glands* lie one on each side of the vaginal orifice close to the posterior end of the bulb, and in front of the posterior layer of the triangular ligament (figs. 6, *g*, and 8, *e*). Each has a long duct opening on the labium minus close to the outer and anterior aspect of the hymen. Ranney asserts that these glands lie behind the posterior layer of the triangular ligament. They are compound mucous glands.

Perineal body.

Between the lower third of the posterior wall of the vagina and the anterior wall of the anus, is an angular interspace filled up by the structure known as the perineal body. This will be more fully described afterwards. At the present stage of the dissection only its base is seen, with the following muscles taking origin from or having an insertion into it,—sphincter ani, transversus perinei, bulbo-cavernosus, levator ani (fig. 6).

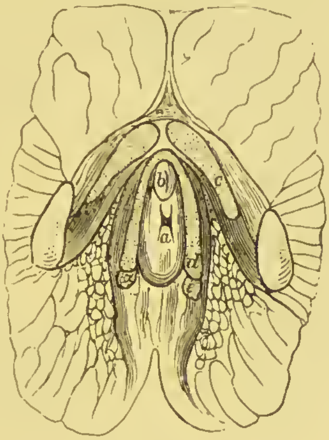


FIG. 8.

OBLIQUE SECTION, parallel to the Anterior Pelvic Wall and through the External Genitals (*Henle*). *a* Vagina; *b* Urethra; *c* Corpus Cavernosum Clitoridis, covered by its Erector; *d* Bulbus Vaginæ covered by Bulbo-covernosus Muscle; *e* Bartholinian Gland.

Between layers of triangular ligament.

Between the layers of the triangular ligament lie the urethra, a portion of the vagina, compressor urethræ, dorsal vein of the clitoris, internal pudic vessels and nerves, the artery to bulb, dorsal nerve of clitoris, internal pudic vessels and nerves, the artery to bulb, dorsal nerve of clitoris, and Bartholinian glands (*Cunningham*).

The dissection of the urethral triangle has now been considered until the bladder has been exposed as it lies behind the pubes, from which it is separated by a considerable amount of loose fatty tissue. In order to complete the consideration, we have now to take up the muscles not yet described, viz., levator ani, coccygeus and the obturator internus.

THE PELVIC FLOOR DISSECTED FROM ABOVE.

The pelvic floor must now be looked at from its internal concave or peritoneal aspect. If the peritoneum and connective tissue beneath it, with the nerves and blood-vessels, be removed on one side of the pelvis, say the right, the two muscles known as the coccygeus and levator ani will be exposed. These spring from the middle of the inner side of the true pelvis, and blending partly directly and partly indirectly with one another, form what may be termed the diaphragmatic muscles of the pelvic floor. If looked at through the pelvic brim, they are seen to form on both sides a concave arrangement analogous to the thoracic diaphragm (fig. 9).

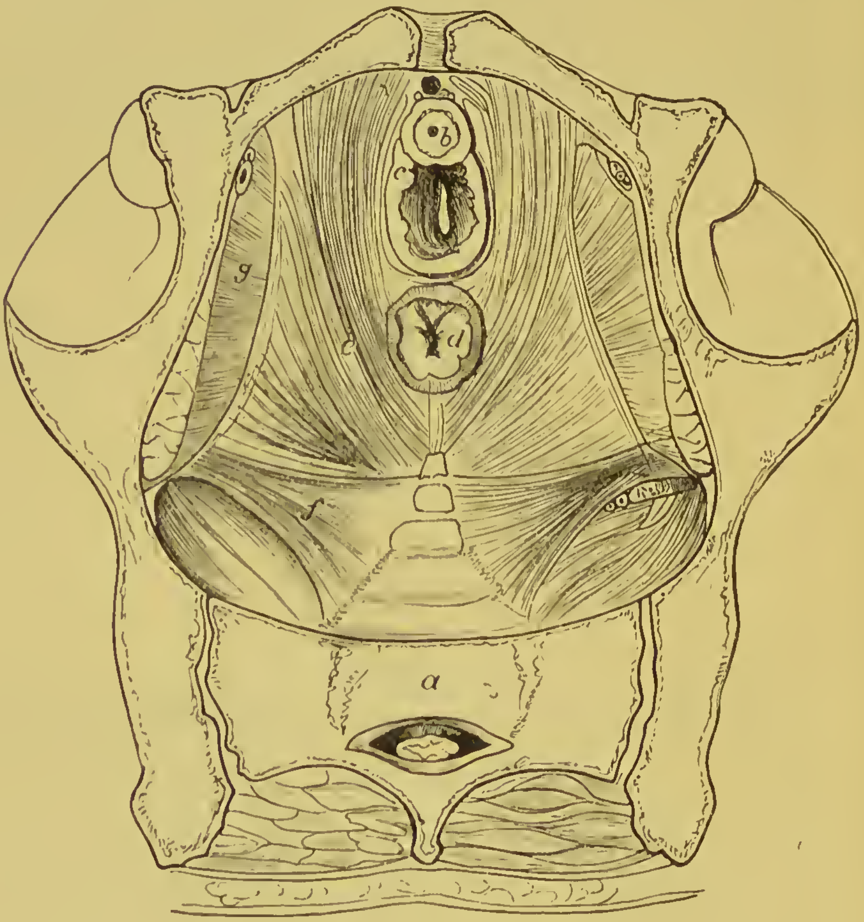


FIG. 9.

DISSECTION OF PELVIS from above (*Savage*).

a Sacrum ; *b* Urethra ; *c* Vagina ; *d* Rectum ; *e* Levator Ani ; *f* Coccygeus ; *g* Obturator internus. (½)

Coccygeus. The *Coccygeus* springs from the spine of the ischium and is inserted into the side of the lower part of the sacrum, and side and front of coccyx. There are two coccygei, one on each side (figs. 9, *f*, and 10).

Levator Ani. The *Levator Ani* has an extensive origin. It springs in front from the back of the body and horizontal ramus of the pubes, from the pelvic fascia (white line) and the spine of the ischium. From this the muscle sweeps downwards and inwards to become attached in the middle line from before backwards as follows,—to the vagina, the rectum, its fellow of the opposite side, and finally to the tip of the coccyx (fig. 10). The pubic fibres blend "with the posterior half of the upper border of the sphincter vaginæ" (Doran).

The levator ani can act on the vagina, elevating and compressing it, and is also believed to aid the sphincter ani.

The *Obturator internus* has the following origin: deep surface of obturator membrane except at its lowest part; fibrous arch completing canal for obturator vessels and nerves; and surface of true pelvis bounded above by iliopectineal eminence, posteriorly by great sciatic notch, inferiorly by ischial tuberosity. Its relations are well shown in axial-transverse sections. Its inferior half bounds the ischiorectal fossa; its upper half, the bladder and levator ani. It can also be seen that it lies in relation to the broad ligaments—*i.e.*, it bounds them where the peritoneal laminæ diverge.

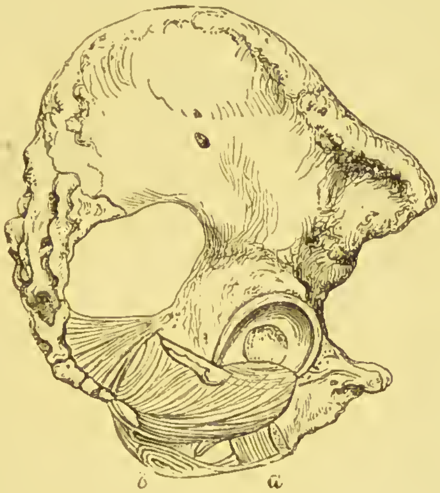


FIG. 10.

LEVATOR ANI and COCCYGEUS seen from without, after removal of part of pelvic bone and clearing out of Ischiorectal Fossa (*Luschka*).

a Fibres of Levator Ani on Vagina; *b* Anus, with Sphincter. (¼)

We have now to take up the consideration of the generative organs. It is difficult to describe these without alluding to structures not fully considered until further on. The student may, therefore, not entirely grasp some of the points until the whole anatomy of the organs has been mastered.

THE UTERUS AND ITS ANNEXA.

The *Uterus* (Pl. I.) is a triangular body, with a truncated apex downwards, placed between the bladder and rectum, and with the appearance The Uterus.

seen at figs. 11, *A*, and 12, *B*. In describing it we take up its external appearance, its nature on section, and its structure and relations.

Corpus Uteri.

On external examination we find the parts known as the body (fig. 11, *A*, *c*) and neck (fig. 11, *A*, *a*, *b*). Keeping in mind its description as a triangle, we see the neck occupying the apex and the uterine orifices of the Fallopian tubes at the other two angles. Between the Fallopian tubes lies the fundus uteri. The anterior surface of the uterus is almost flat; the posterior is convex at its upper part, as is well seen in fig. 11, *B*. Where the body passes into the cervix there is a slight depression noticed on the posterior surface. This corresponds to the isthmus.

Cavity of Uterus.

On making a vertical mesial section, we observe that the uterus is a hollow organ possessing a cavity with the anterior and posterior walls in apposition (fig. 11, *B*). In order to see the cavity it is advisable to look at the uterus in coronal section—*i.e.*, a section which, passing through the cavity, divides the uterus into an anterior and a posterior half, as shown in fig. 11, *C*, fig. 12, *A*. This latter section enables us more fully to understand the division of the uterus into body proper and cervix, and the division of the uterine cavity into cavity of the body proper and cervical cavity.

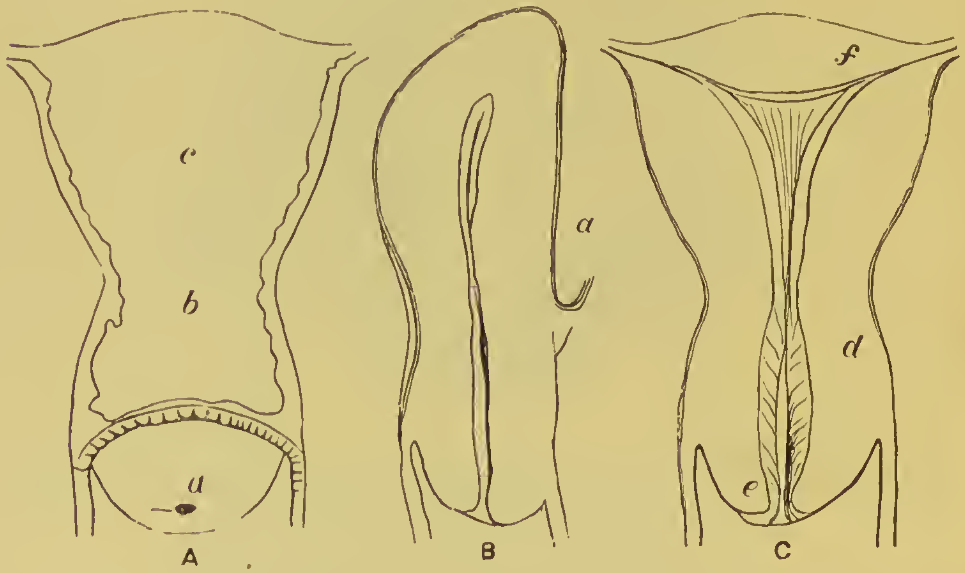


FIG. 11.

A. VIRGIN UTERUS (front view) (*Sappey*). The Appendages and Vagina are cut away.
a Cervix (vaginal portion); *b* Isthmus; *c* Body; *a b* Cervix proper.

B. The SAME in vertical mesial section.
a is anterior surface, and lies just above where peritoneum passes on to bladder.

C. The SAME with cavity exposed by coronal section.
e Os Externum; *d* Os Internum; *f* Uterine Opening of Fallopian Tube. ($\frac{2}{3}$)

Cavity of Body.—This is a triangular slit in the uterus with the apex downwards, and with anterior and posterior walls. At each angle there is an opening, viz., at the lower angle we have the *os internum* opening into the cervical canal (fig. 11, *C*, *d*), and at the upper angle the uterine openings of the Fallopian tubes (fig. 11, *C*, *f*). The lining of the cavity is known as its mucous membrane.

Cavity of the Cervical Canal.—This is spindle-shaped or conical (fig. 11, *B*, *C*), and has two openings, viz., os internum above and os externum below. The former opens into the uterine cavity, the latter into the vagina.

Cervix Uteri.

The *Cervix* is divided into two portions, the vaginal and the supravaginal. The vaginal portion is within the vagina, and appears as a conical mass of the size and shape seen at fig. 11, *A*, *a*. The os externum is in virgins a mere dimple, and feels to the examining finger like the tip of the nose. In women who have borne children it is transverse (fig. 12, *B*), and in most cases has its lips fissured more or less deeply, and the mucous membrane of the cervical canal partially everted. The supravaginal portion is continuous with the body through the isthmus.

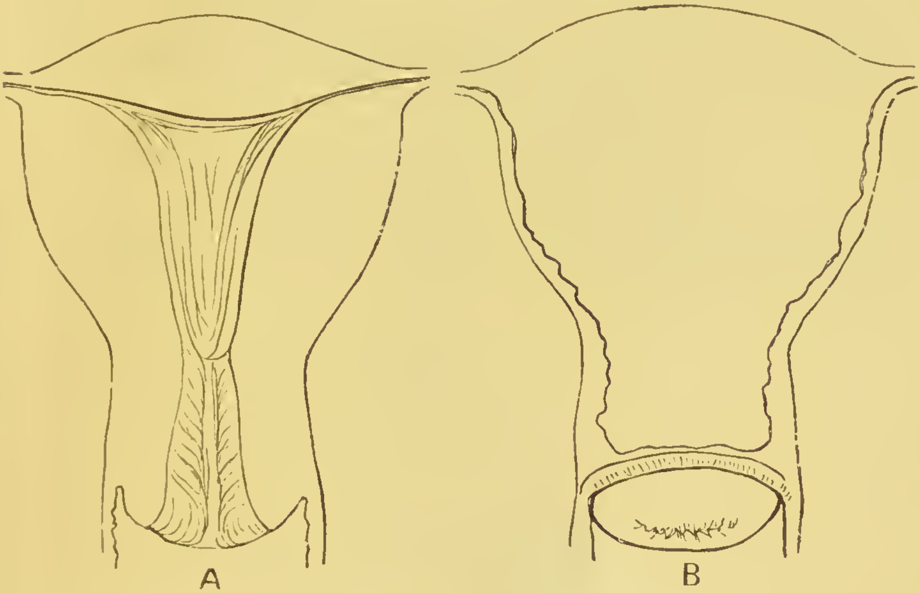


FIG. 12.

A. MULTIPAROUS UTERUS in coronal section to show cavity.
B. MULTIPAROUS UTERUS from front (*Sappey*). ($\frac{2}{3}$)

The length of the whole unimpregnated uterus is, speaking generally, about 3 inches; the length of the cavity of cervix and body about $2\frac{1}{2}$ inches.

Measurements with the sound on the living female are a little in excess of those obtained in sections on cadavera, owing probably to the sound's elongating the uterus somewhat.

	Virgin.	Nulliparæ.	Multiparæ.
Length of uterus	2·35 in.	2·50 in.	2·70 in.
Width	1·50 ,,	1·55 ,,	1·70 ,,
Thickness	0·85 ,,	0·90 ,,	1·00 ,,
			Sappey.
Vertical diameter of cavity	1·80 ,,		2·44 in.
Transverse ,, ,,	0·60 ,,		1·24 ,,
			Richet.
Length of entire organ in young women			5-6 cm.
Do. body of uterus			3-3·5 ,,
Do. cervix			2-3 ,,
Do. vaginal portion of cervix			·55-·6 ,,
			Hennig.

Capacity of uterus in nulliparæ 2-3 c.cm.; in multiparæ 3-5 c.cm. *Sappey.*

Divisions of Cervix Uteri.

Various authors divide the cervix uteri more minutely as follows. They consider it as made up of—

a. A vaginal portion;
b. An intermediate or middle portion;
c. A supravaginal portion. (Fig. 13.)

This view is of importance in relation to the seat and extent of the changes in the size of the uterus in prolapsus uteri.

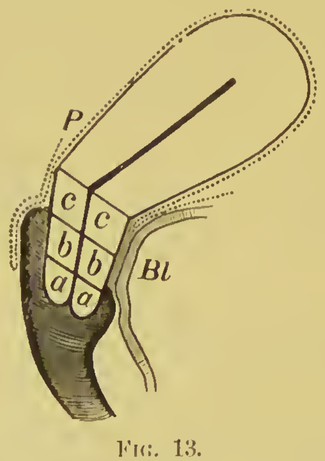


FIG. 13.

DIAGRAM OF UTERUS to show divisions of Cervix (*Schroeder*).
a Vaginal portion; *b* Intermediate portion; *c* Supravaginal portion; *Bl* Bladder; *P* Peritoneum. The dotted line shows peritoneum.

Position of Os Internum.

The question as to the precise position of the os internum in the unimpregnated uterus is at present much disputed. Küstner, who has examined the point carefully, places the os internum at the narrow part where the lumen of the cervical canal becomes continuous with that of the uterine cavity proper. This part lies at the level of the isthmus uteri (*v.* fig. 14), and is also the point where the complicated uterine musculature passes into the simpler cervical muscular arrangement.

The folds of the arbor vitæ sometimes cease at this point, but may pass above it or in multiparæ may end below it.

Küstner also alleges that for ½ cm. ($\frac{1}{5}$ in.) below the os internum as defined by him the cervical substance and mucous membrane are like that of the uterine body, and that this special part of the cervical canal participates in the menstrual and pregnancy changes; and he therefore terms this the "inferior uterine segment," and speaks of a "cervical decidua." The os internum is believed by some to be at the level where the peritoneum passes on to the bladder.

Lower Uterine Segment.

While the two great divisions of the uterus are the *body* and *cervix*, it is of importance to keep in mind that in pregnancy we distinguish a special part of the body as the Lower Uterine Segment. It has the following characteristics: the peritoneum is loosely attached over it, the muscular wall thinner there and the muscular bundles more separable; further, it plays in labour a passive rôle, and comes to be marked off from the part above by a thickening in the wall known as the contraction or retraction ring. We may show the relations of all the divisions in the following scheme:—

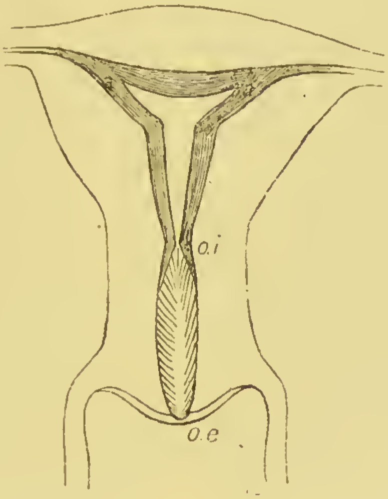


FIG. 14.

CORONAL SECTION OF UTERUS (*Küstner*).

a. a. Uterine opening of Fallopian tubes; *o. i.* Os Internum; *o. e.* Os externum.

Body (*in pregnancy*) { Upper portion (upper two-thirds).
Lower Uterine Segment (lower one-third).

Cervix . . . { supravaginal portion.
intermediate ,,
vaginal ,,

Küstner, as we have seen, speaks of the inferior uterine segment as cervical in origin.

Structure of Uterus.

Structure of the Uterus.—If the uterus be viewed in vertical mesial section, it will be seen to be made up of three distinct elements, viz., peritoneum, unstriped muscular fibre, and mucous membrane (fig. 11, *B.*). The peritoneum covers, partially, its external surface; the mucous membrane lines the cavity of the body and cervix; while the muscular fibre, by far the largest constituent, forms the tissue lying between these.

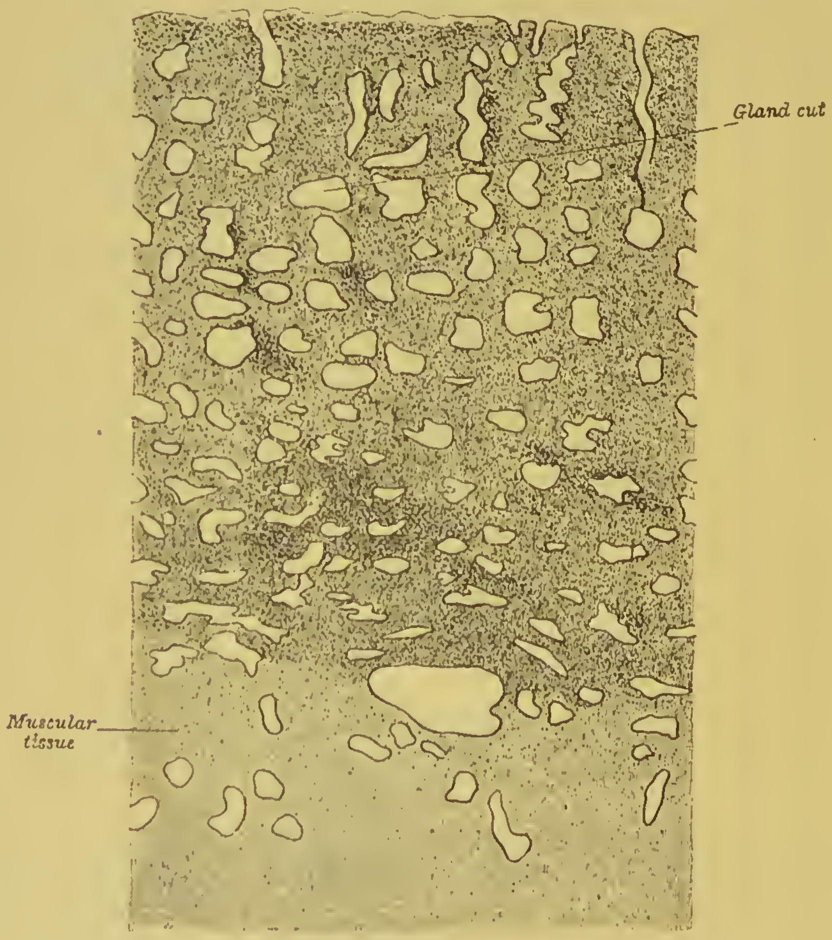


FIG. 15.

Mucous membrane of Uterus to show glands and interglandular tissue; the mucous membrane is thicker here than normal.

Peritoneum of Uterus.

The Peritoneum of the Uterus clothes its posterior surface (except the vaginal and middle portions of the cervix), but only dips down on the front surface as far as the isthmus, at which level it is reflected on to the bladder (fig. 11, *B*, *a*). At the sides of the uterus the peritoneum on the anterior and posterior surfaces runs out to the wall of the pelvis, thus forming the important structures known as the broad ligaments.

Ligaments of Uterus.

The *Ligaments* of the uterus are—

Broad ligaments;
Round ligaments;
Utero-sacral and Utero-vesical.

The broad ligaments are described under the peritoneum. (See p. 42).

Round Ligaments.

The round ligaments (Pl. I.) are two in number. According to Rainey, each springs by three fasciculi of tendinous fibres—the inner from the tendons of the internal oblique and transversalis, the middle from the superior column of the external abdominal ring near its upper part, and the outer fasciculus from just above Gimbernat's ligament. These unite into a rounded cord which crosses in front of the deep epigastric artery and passes between the layers of the broad ligaments backwards, downwards, and inwards to the anterior and superior part of the uterus. Striped and unstriped muscle, blood-vessels, etc., are found in each. These ligaments are of importance in connection with the operative treatment of backward displacements of the uterus.

Utero-sacral Ligaments.

The utero-sacral ligaments are peritoneal folds, two in number, enclosing connective tissue and unstriped muscular fibre, passing from the lower, lateral part of the body of the uterus outwards and backwards towards the second sacral vertebra. They are known as the folds of Douglas, and form part of the upper, lateral boundaries of the pouch of Douglas. They are of the highest importance practically. The peritoneum, as it passes between the uterus and bladder, constitutes the utero-vesical ligaments.

Utero-Vesical Ligaments.

Musculature of Uterus.

The *Musculature of the Unimpregnated Uterus* is of little importance in Gynecology, and needs only a passing notice. Three coats are described: a thin subperitoneal coat passing into the round ligaments, broad ligaments, utero-sacral and utero-vesical ligaments; a middle coat; and an inner concentric and very abundant layer which surrounds the Fallopian tubes, os externum, and os internum. The student should not forget that the arrangement of the muscular fibres is of the highest importance in practical obstetrics.

Mucous Membrane of Uterus.

The *Mucous Membrane* of the cavity of the body of the uterus is a thin reddish-gray layer, about 1 mm. ($\frac{1}{25}$ inch) thick in the fully developed but unimpregnated organ. It is set on the inner aspect of the muscular layer of the uterus without the intervention of any submucous layer, is made up of ciliated columnar epithelium on a basis of connective tissue, and has numerous glands—the utricular glands. On section and microscopic examination, the glands, lined by the ciliated epithelium, lying, according to some, on a thin membrana propria can be seen coursing down obliquely from the free surface and ending at, as well as sometimes dipping for a short distance into the muscular fibre. Fig. 15 shows the glands cut irregularly at various levels; they are more abundant than usual in this specimen (fig. 16). The glands usually bifurcate at their lower ends, and two may have a common mouth. Some of them penetrate the muscular fibre and can thus regenerate the mucous membrane after complete curetting.

The connective tissue in which the glands are embedded consists of delicate, round, and spindle-shaped cells, the former being more abundant near the surface, the latter deeper. Fibrillated bundles of connective tissue lie also between the cells and pass out between the muscular fibre of the uterine wall. According to Leopold, the connective tissue is in the form of a plexus of fine bundles, covered with endothelial plates each with a nucleus. The spaces between these bundles form lymph sinuses.

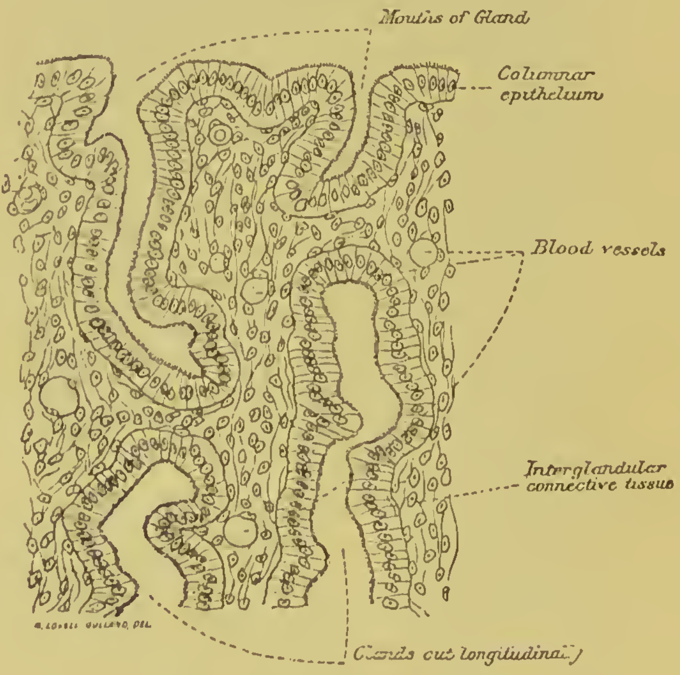


FIG. 16.
MUCOUS MEMBRANE OF UTERUS ($\frac{200}{1}$). (*Gulland*).

Mucous Membrane of Cervix.

The *mucous membrane* lining the cervix is different in arrangement and structure from that lining the cavity of the uterus. It is thrown into numerous folds, presenting to the naked eye the appearance known as the arbor vitæ, which consists of a longitudinal mesial ridge on the anterior and posterior walls, from both sides of which secondary ridges branch off obliquely. It is lined throughout with a single layer of epithelium (fig. 17), which is ciliated on the elevated portion of the ridges, but is simple columnar in the depressed portions (*de Sinéty*).

The upper boundary of the arbor vitæ varies. The boundary lies about midway between os externum and fundus. Before puberty, the folds pass up into the cavity of the body. In multiparæ, they do not pass up so far as in nulliparæ (Küstner).

The glands are of the racemose type; and consist of elongated, repeatedly branching ducts, which extend deeply into the connective tissue, and are somewhat dilated at their extremities (*Ruge* and *Veit*). They are lined by columnar epithelium, resting on a membrana propria, and open on the ridges and furrows of the mucous membrane.

There is a sharp line of demarcation between this single layer of epithelium (columnar and ciliated) which lines the cervical canal and the epithelial covering of the external surface of the vaginal portion, and this line of demarcation corresponds in the adult to the os externum. Beyond the os externum, the epithelial covering has all the characters of skin; it consists of vascular papillæ covered with many layers of squamous epithelium. The vascular papillæ are not easily recognised without the help of reagents (*Ruge* and *Veit*). The epithelial cells are like those found in the skin, and dovetail into one another by denticulate edges.

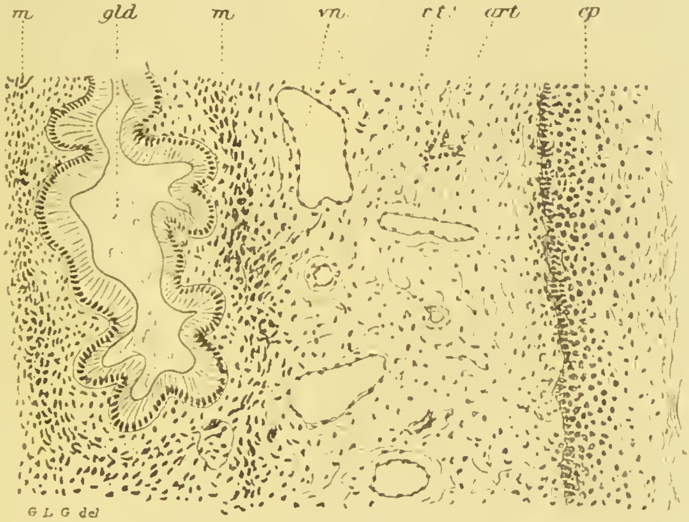


FIG. 17.

CERVIX UTERI.—Semidiagrammatic. *gld*, Gland. *ep*, Squamous epithelium of vaginal portion. *art*, Artery. *vn*, Vein. *ct*, Connective tissue. *m*, Non-striped muscle. ($\frac{200}{1}$). (*Gulland*).

It is a disputed question whether glands are present on the vaginal aspect of the normal cervix. De Sinéty says he has never met with them except in the neighbourhood of the os externum, and their occurrence there he attributes to an eversion of the mucous membrane of the canal. Ruge and Veit also consider the existence of glands as a pathological condition, which is, however, easily induced.

The normal histology of the cervix uteri has an important bearing on the pathology of the so-called ulcerations and on laceration of the cervix and ectropium.

FALLOPIAN TUBES.

Fallopian Tubes.

The *Fallopian tubes* are two tubes, one on each side of the uterus, running sinuously from its upper angles out towards the side of the pelvis (Plate I. and figs. 18 and 37). They lie enclosed in the upper free margin of the broad ligaments, and vary in length from 10 to 11 cm (4 to 4⅗ inches). They are not of equal length, the right being frequently longer than the left.

The Fallopian tube, the uterus lying to the front (anteverted), has been found by His to pass first outwards and then upwards over the ovary, the fimbriated end lying on the posterior aspect of the ovary (Pl. II., fig. 2). Three parts come up for consideration—the isthmus, the ampulla, and the pavilion or fimbriated end.

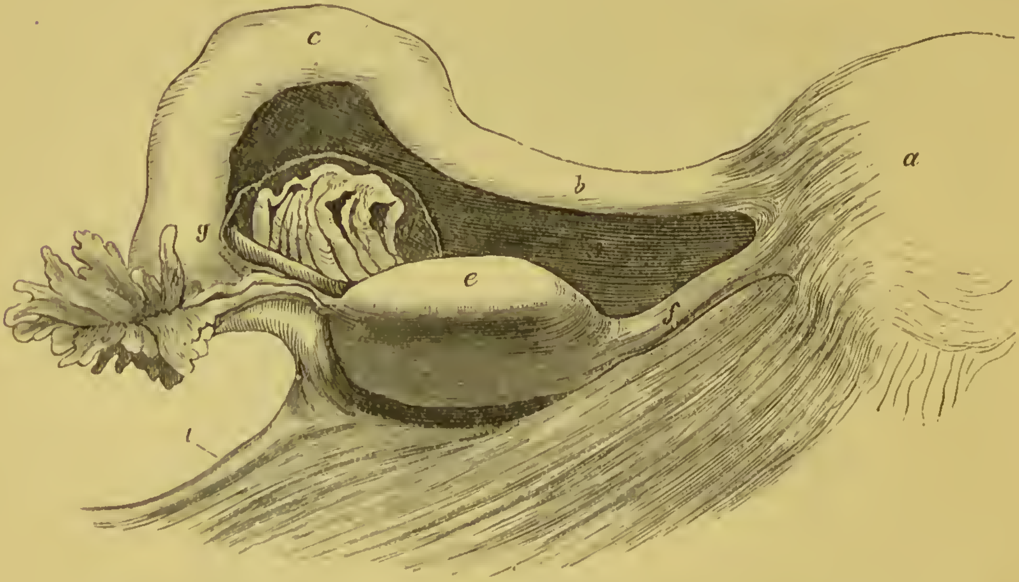


FIG. 18.

VIEW from behind of the LATERAL ANGLE of the UTERUS, with part of the Left Broad Ligament, Fallopian Tube, Ovary, and Parovarium (*Henle*).

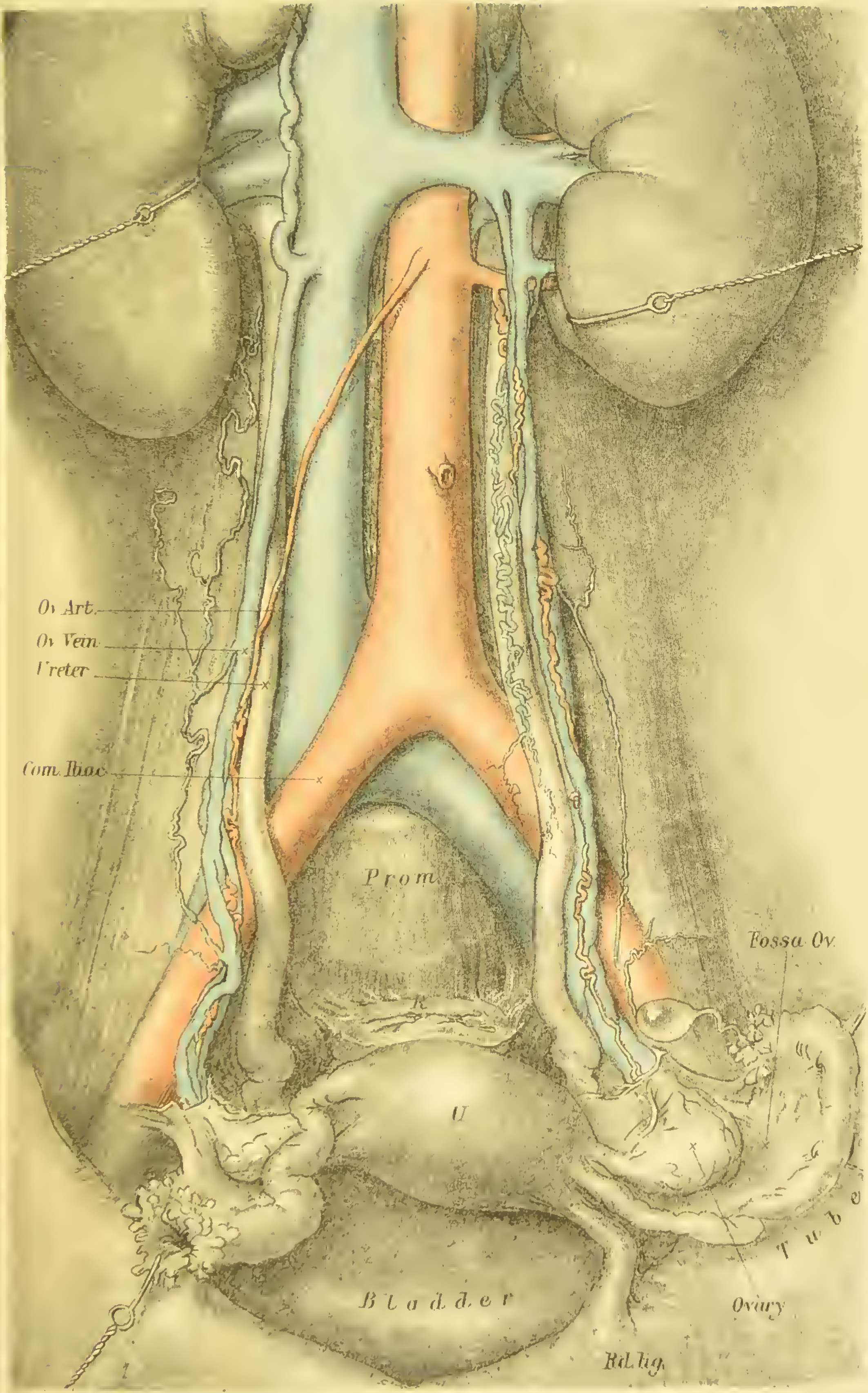
a Uterus; *b* Isthmus of Fallopian Tube; *c* Ampulla; *g* has Parovarium to the right, and Fimbriated end of Fallopian Tube and Ovarian Fimbria just below it; *d* Parovarium; *e* Ovary; *f* Ovarian Ligament; *l* Infundibulo-pelvic Ligament (†). The topographical relations are disturbed here.

Isthmus.

The *isthmus* is the straight narrow part of the tube (fig. 18, *b*), which at its internal end opens into the uterine cavity, and has a lumen barely admitting a bristle. On transverse section the diameter of the whole thickness is about 2 to 3 mm.

Ampulla.

The *ampulla* is the curved and thick part of the tube (fig. 18, *c*), having an average diameter of about 6-8 mm., with a lumen admitting the ordinary uterine sound.



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BLOOD VESSELS, URETER, AND PELVIC ORGANS (KELLY).

Fimbriæ.

The free *fimbriated end* of the Fallopian tube is expanded and funnel-shaped (infundibulum); and it is provided with primary and secondary fimbriæ surrounding the opening of the tube to which they converge. One special fimbria runs to the ovary (fig. 18, *g*).

Structure of Fallopian Tube.

On section the Fallopian tube is seen to be made up of three layers from without inwards: viz., peritoneum, longitudinal and circular unstriped muscular fibres (the latter being inner), and mucous membrane lined with ciliated columnar epithelium. Connective tissue and elastic fibres lie between the peritoneal and muscular layers. No glands exist in the mucous membrane which is much folded in a longitudinal direction, especially in the ampulla. Bland Sutton, however, believes the folded mucous membrane to be glandular, and to afford an albuminous covering to the ovum as it passes down.

It is remarkable that the ciliated epithelium lining the Fallopian tube and pavilion should be continuous with the squamous epithelium of the peritoneum; and that, further, there is direct continuity between the vagina, uterus, Fallopian tubes, and peritoneum,—so that the peritoneal sac in the female is not closed as in the male. The importance of this anatomical fact cannot, from a pathological point of view, be over-rated.

Parovarium.

Parovarium or Organ of Rosenmüller.—If the broad ligament be held between the light and the observer's eye, this rudimentary structure will be seen enclosed in its folds in the space between the ovary and ampulla (fig. 18, *d*). It consists of closed tubules lined with ciliated epithelium, which converge towards the ovary, and are united by a longitudinal one.

In the cow and sow the longitudinal tube or Wolffian duct persists, extending in the latter animal from a point a little above the division of the uterus into its cornua down the side wall of the vagina and opening into the vagina at the sides of the urethral orifice. These are named Gartner's canals after their chief investigator, and they correspond to the vas deferens, etc., in the male. Beigel has shown that these canals may be found in the uterus of the human fœtus, a statement verified by Kölliker, Dohrn, and others. According to Rieder, they may persist either as a closed muscular epithelium-lined tube or as a muscular bundle without epithelium. The epithelial lining consists of a single or double layer of cylindrical cells (cells = 16μ.): this is surrounded by connective tissue and by three coats of unstriped muscular fibre (inner and outer longitudinal and middle circular). It may produce one form of cervical or vaginal cyst as was shown by von Preuschen (*v.* chapters on Development, Ovarian Pathology, and Vaginal Cysts).

OVARIES.

Ovaries

The ovaries (Pl. I. and fig. 18), two in number, lie one on each side of the uterus, projecting markedly through the posterior layer of the broad ligament.

Form, Size and Relations.—The ovary is a small oval-shaped body about the size of an almond, the weight of which varies from 60 to 135 grains. According to Farre its measurements are as follows:—

	Longitudinal Diameter.	Transverse Diameter.	Perpendicular Diameter.
Greatest . . .	2 in.	$1\frac{1}{12}$ in.	$\frac{1}{2}$ in.
Smallest . . .	1 in.	$\frac{1}{2}$ in.	$\frac{1}{4}$ in.
Average . . .	$1\frac{1}{3}$ in.	$\frac{3}{4}$ in.	$\frac{3}{8}$ in.

The ovary has an anterior and posterior border, and an upper and lower surface. The posterior border is convex and free, the anterior flattened and attached to the broad ligament. It should be noted that this anterior border is called the hilum, and that the blood-vessels and nerves enter there.

The position of the ovary will be discussed afterwards (p. 55), but at present it is sufficient to consider it as lying behind the broad ligament and on the side wall of the true pelvis, suspended as it were by the infundibulo-pelvic ligament so that its long axis lies more or less parallel to the axis of the brim of the pelvis.

Ovarian Fossa.—The ovary lies in a shallow fossa of the broad ligament, the ovarian fossa. In the rat, seal, and other animals the ovary is surrounded by a peritoneal fold, and thus completely cut off from the peritoneal cavity. It is possible this may happen in the human female, giving rise to one form of tubo-ovarian cyst, but as a rule the human ovary is uncovered by peritoneum, and thus lies inside the peritoneal cavity.

Ligaments of Ovary.

Ligaments of the Ovary.—In addition to the attachment which the broad ligament gives to the ovary, two important ligaments are described—the ovarian ligament and the infundibulo-pelvic ligament.

Ovarian Ligament.

The *Ovarian Ligament* (fig. 18, *f*) is about 3 cm. ($1\frac{1}{5}$ inch) long, and extends from the inner end of the ovary to the corresponding upper angle of the uterus, just below the uterine origin of the Fallopian tube. It is a longitudinal fold of the peritoneum into which the unstriped muscular fibre of the uterus is prolonged.

Infundibulo-Pelvic Ligament.

The *Infundibulo-Pelvic Ligament* (fig. 18, *l*) is about 2 cm. long, and runs from the outer end of the Fallopian tube to the side wall of the pelvis. It is simply that part of the upper margin of the broad ligament unoccupied by Fallopian tube.

Ovarian Fimbria.

The *Ovarian Fimbria* (fig. 18, *g*) prevents the separation of the ovary and infundibulum tubae.

Thus the ovary is kept in position by its attachment to the broad ligament, by the ovarian and by the infundibulo-pelvic ligaments. Its own specific gravity has also a share, *i.e.*, the ovary floats at a certain level.

Structure of Ovary.

Structure of the Ovary.—The ovary is covered with epithelium differing from the squamous epithelium of the peritoneum in being made up of columnar nucleated cells with a dull lustre. It is continuous at the hilum, however, with the peritoneal epithelium, the line of contact being marked by a whitish and elevated line—the white line of Farre. The epithelium covering the ovary is known as the germ-epithelium of Waldeyer. This distinctive term is of importance in connection with the development of the ova, and will be more particularly alluded to afterwards. A tunica albuginea made up of condensed connective tissue lies below the germ-epithelium.

On section and microscopical examination, the ovary is found to consist of connective tissue with the structures known as the Graafian follicles embedded in it, along with blood-vessels, nerves, lymphatics, and some unstriped muscular fibre. These are enclosed in the epithelial covering already described. The connective tissue is divided into a cortical and medullary layer; the former lying beneath the germ-epithelium, the latter being at and near the hilum. The medullary layer is very vascular, and has some unstriped muscular fibre round the branches of the ovarian artery (fig. 19).

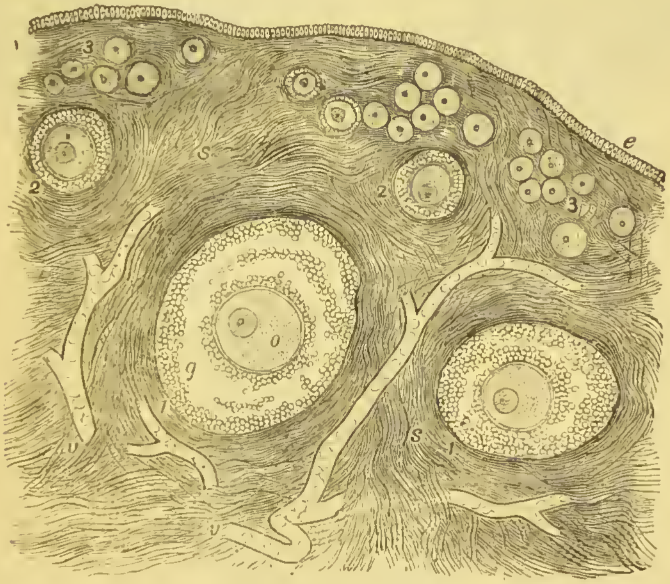

Fig. 19.

Section through the Cortical part of the Ovary (*Turner*).

e Germ Epithelium; *ss* Ovarian Stroma; 1, 1, large-sized Ovarian Follicles; 2, 2, middle-sized; and 3, 3, smaller-sized Graafian Follicles; *o* Ovum within Graafian Follicles; *v*, *v*, Blood-vessels in the Stroma; *g* Cells of Membrana Granulosa.

The Graafian follicles are scattered through the whole substance of the ovary. The following points should be carefully noted.

a. The younger and smaller Graafian follicles lie in the cortical layer. Their diameter is generally about $\frac{1}{100}$th in., and they exist in immense numbers. According to careful estimates, the ovary of a female infant may contain 40,000 to 70,000 such follicles.

b. The larger follicles are much fewer in number and lie deeper in the ovary. Diameter $\frac{1}{30}$th to $\frac{1}{100}$th in.

c. There are also still larger follicles nearer the surface than the latter. These have advanced from the deeper layer (*vide* under Menstruation).

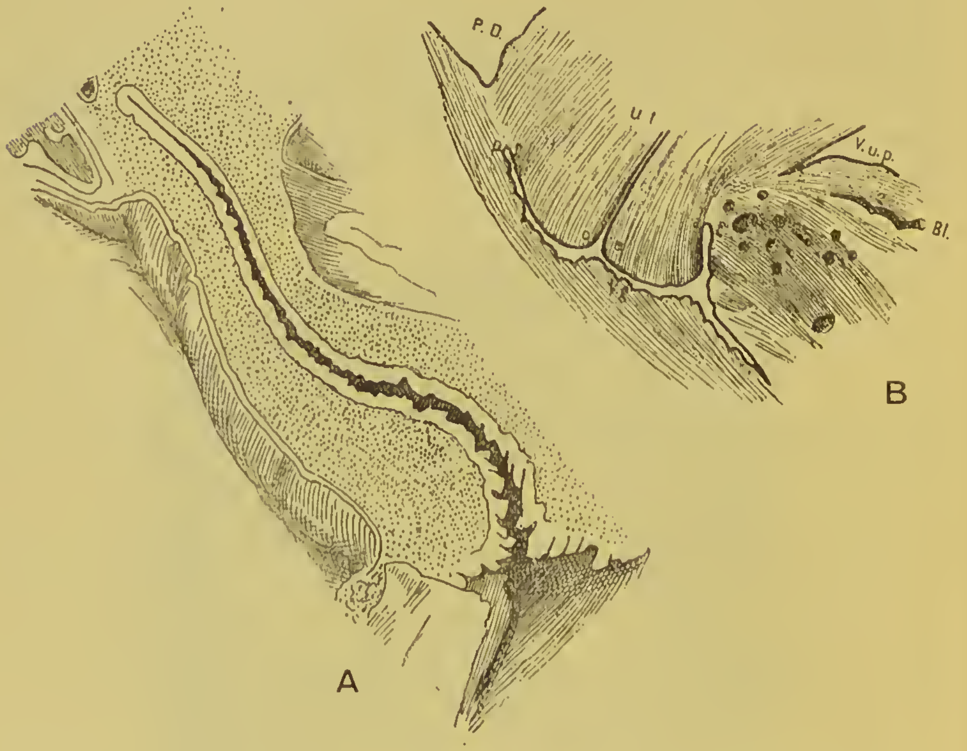

Fig. 20.

A Section of Whole Vagina passing through Lateral Fornix; and *B* Section of Upper Third passing through the Cervix Uteri (*Hart*).

P. D. Pouch of Douglas; ut Uterus; o e Os Externum; Vg Vagina; p f Posterior Fornix; a f Anterior Fornix; V.u.p. Vesico-uterine Peritoneum; Bl. Bladder.

Structure of a Graafian Follicle. This consists of

1. A Tunica fibrosa and Membrana propria;
2. The Membrana granulosa, a layer of nucleated columnar epithelial cells forming the discus proligerus at one part;
3. Fluid—the liquor folliculi.

The *ovum* (diameter $\frac{1}{100}$ to $\frac{1}{130}$ in.) lies in the discus proligerus; it has the following structure:—

1. External envelope—zona pellucida, a homogeneous membrane,
2. Yelk protoplasm,
3. Germinal vesicle ($\frac{1}{700}$th in. diameter),
4. Germinal spot ($\frac{1}{3000}$th in. diameter).

Function of Ovaries.—Besides the production of ova in relation to menstruation and pregnancy, the ovaries like the thyroid and supra-renal bodies are held to play a part in metabolism through an internal secretion. This view has led to a more conservative method in the surgical treatment of diseased appendages. It has been found experimentally that they influence the elimination of phosphorus, which explains the benefit of castration in malacosteon disease.

THE VAGINA.

Vagina—Position.

The vagina is a mucous slit in the pelvic floor, extending from the hymen to the cervix uteri, and lying between the urethra and bladder in front and the rectum behind. In the upright posture it makes an angle of about 60° with the horizon, *i.e.*, it is nearly parallel to the brim conjugate.

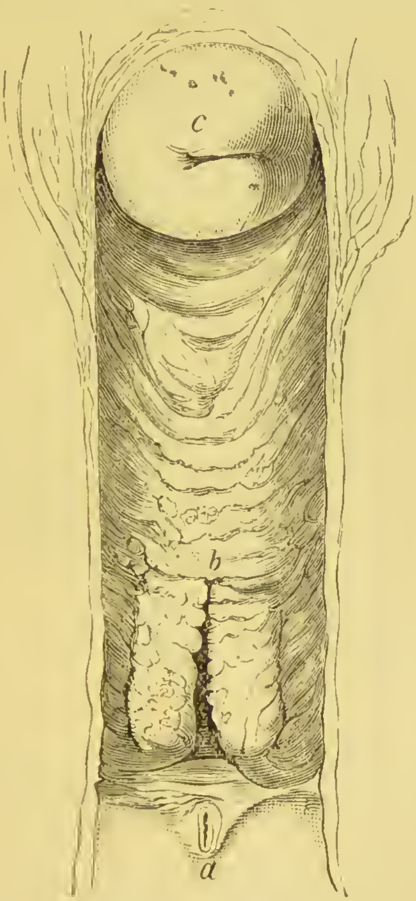

FIG. 21.

ANTERIOR VAGINAL WALL AND MULTIPAROUS CERVIX, looked at from behind (*Henle*).
a Urethral Orifice; *b* Anterior Vaginal Column; *c* Cervix Uteri. ($\frac{1}{1}$)

Vaginal Walls.

The vagina has two walls, an anterior and posterior, which are continuous at their sides. The anterior vaginal wall is triangular in shape, the base being above. Its lower limit is marked out by the hymen.

At its upper end it is reflected down to a small extent on the anterior lip of the cervix uteri, the anterior fornix being thus formed (fig. 20). It is closely incorporated with the urethra, but between it and the posterior aspect of the bladder there is loose connective tissue. Its length is about 5 cm., *i.e.*, 2–2½ inches.

Vaginal Mucous Membrane.

The mucous membrane of the wall is arranged in folds roughly transverse. At its lower end is a vertical mesial single or double thickening of the mucous membrane, about 2 cm. long, known as the anterior vaginal column (fig. 21, *b*). This begins near the urethral orifice, or about 1½ cm. above it. According to Budin, the columns are prolonged on the hymen.

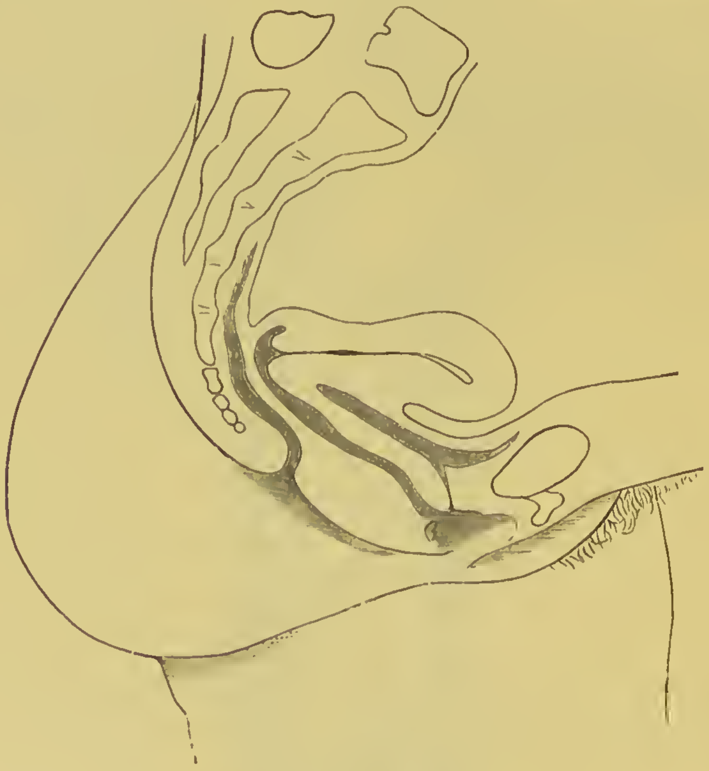

FIG. 22.

DIAGRAM OF VERTICAL MESIAL SECTION OF FEMALE PELVIS, showing Sigmoid curve of posterior Vaginal Wall (*Schultze*). (¼)

The posterior vaginal wall is triangular in shape, and extends from the hymen upwards to the cervix uteri, upon which it is reflected, thus forming the posterior fornix vaginæ, which is deeper than the anterior one. Its length is about 7½ cm. (3 inches), *i.e.*, about 2½ cm. (nearly an inch) longer than the anterior. It is also transversely rugous, and has a posterior column analogous to the anterior, but smaller. The vaginal rugæ can also be seen on the inner aspect of the hymen.

While the direction of the anterior vaginal wall is almost straight, that of the posterior vaginal wall is sigmoid (fig. 22). The curve varies, however, according to the position of the uterus and the fulness or emptiness of the adjacent bladder and rectum.

When the bladder and rectum are empty, we find the direction of the vagina parallel to the pelvic brim. When the bladder is distended, the vagina is, chiefly at its upper part, driven nearer the sacrum; while, if the rectum be distended, the vaginal axis may be almost perpendicular.

Structure of Vagina.

Structure of Vagina.—The vaginal wall, on section and microscopical examination, is found to consist of mucous membrane, made up of epithelium (fig. 24) (the superficial layer being squamous and nucleated, the deeper layer cylindrical and with elongated nuclei), connective tissue, elastic tissue, and some unstriped muscular fibre. The superficial layer of the connective tissue forms papillæ, into which blood-vessels project. The epithelium is therefore ridged. External to this lie two layers of unstriped muscular fibre; the inner longitudinal, the outer circular (*Henle*). Breisky alleges the inner to be circular. Von Preuschen has described glands in the vagina, but they are very few in number. He found the ducts lined with squamous epithelium and the deeper part with ciliated epithelium—the latter being continuous with the cylindrical deep cells of the vagina. Gland-like crypts and lymph

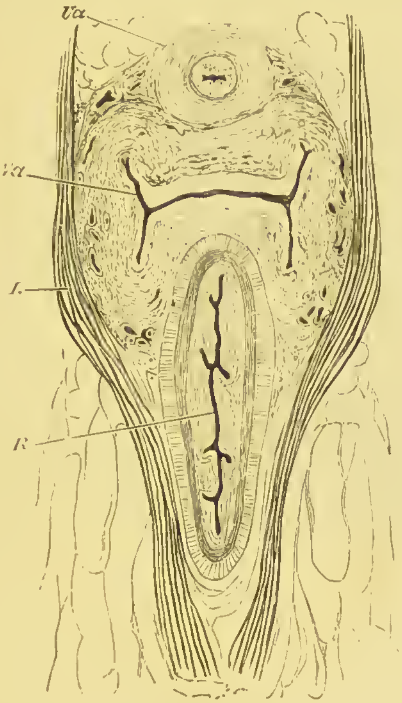

FIG. 23.

HORIZONTAL SECTION OF THE PELVIC FLOOR AT THE PELVIC OUTLET (*Henle*).
Ua Urethra; *Va* Vagina; *R* Anus; *L* Levator Ani.

follicles also exist (*Löwenstein*). The whole is surrounded by loose connective tissue, containing the outer venous plexus of the vagina.

According to Döderlein, the normal vaginal secretion consists of vaginal epithelium, lymph corpuscles; and a bacillus is present which gives an acid reaction (lactic acid) to the discharge.

As already said, the vagina is a mere slit in the pelvic floor, although it is often erroneously described as a tube or cavity. On vertical section, as fig. 20 shows, it appears as a mere linear slit; while on transverse section it is H-shaped, or crescentic (fig. 23). The H-shape is said to be caused by the coalescence of the Wolffian ducts which, with part of the ducts of Müller, form the vaginal canal. The vagina is eminently dilatable and its walls separable, as will be more fully considered under the structural anatomy of the pelvic floor; but this dilatation or separation is the result of posture with manipulation, or of parturition. Under mere changes of posture the vagina retains its slit-like form.

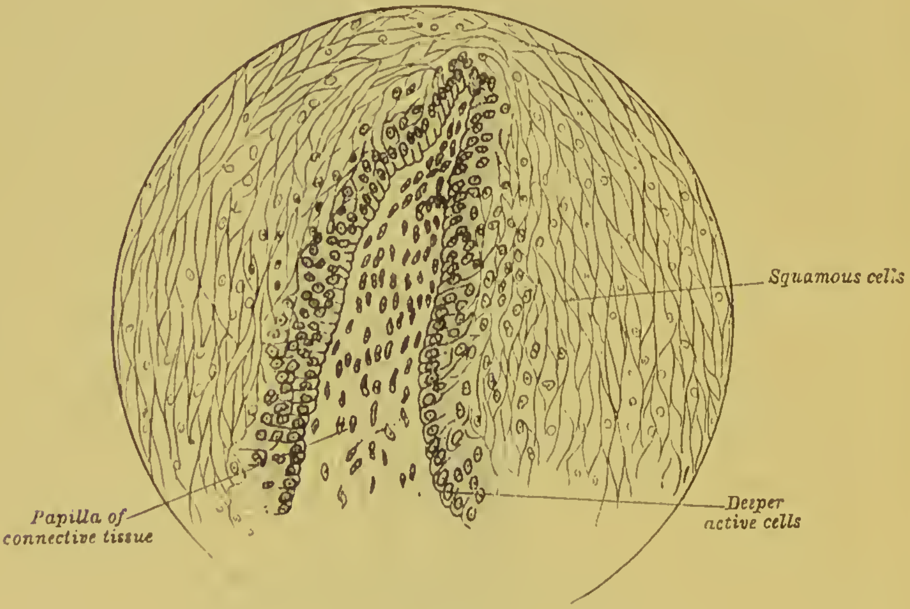

FIG. 24.

SQUAMOUS CELLS OF VAGINA ON PAPILLA OF CONNECTIVE TISSUE.
Note active cells next papilla.

THE URETHRA AND BLADDER.

Urethra—Position. *Position.*—The empty female bladder lies behind the pubes and in front of the vagina.

The urethra is a straight slit (some describe it as sigmoid) about $1\frac{3}{8}$ inches long, with thick walls closely incorporated with the anterior

Microscopic Structure.

vaginal wall behind. It runs parallel to the plane of the pelvic brim. Its lower opening is known as the meatus urinarius, the position of which has been already considered in the section on the External Genitals; its upper opening is at the neck of the bladder. On section and microscopical examination, its mucous membrane is found covered with squamous epithelium in its lower part; while higher up it is like that of the bladder, and is very rich in elastic fibres. There is a double layer of *unstriped* muscular fibre, the longitudinal layer being internal and the circular outside; and, according to Uffelman, a circular (inner) and longitudinal layer of *striped* muscle which stretches from the neck of the bladder to within ·6 in. ($1\frac{1}{2}$ cm.) of the meatus urinarius. Luschka also describes a special sphincter of the vaginal and urethral orifices. It should be further noted that the mucous membrane is folded longitudinally, and contains mucous glands lined with cylindrical epithelium, papillæ, and lacunæ, and also villous tufts near the meatus; and that there is a submucous layer between the mucous membrane and unstriped muscle, containing many veins. Skene of New York has described two tubules in the female urethra. They lie on each side (figs. 25 and 26), "near the floor of the female urethra, and extend up from the meatus urinarius for about $\frac{3}{4}$ inch. They lie beneath the

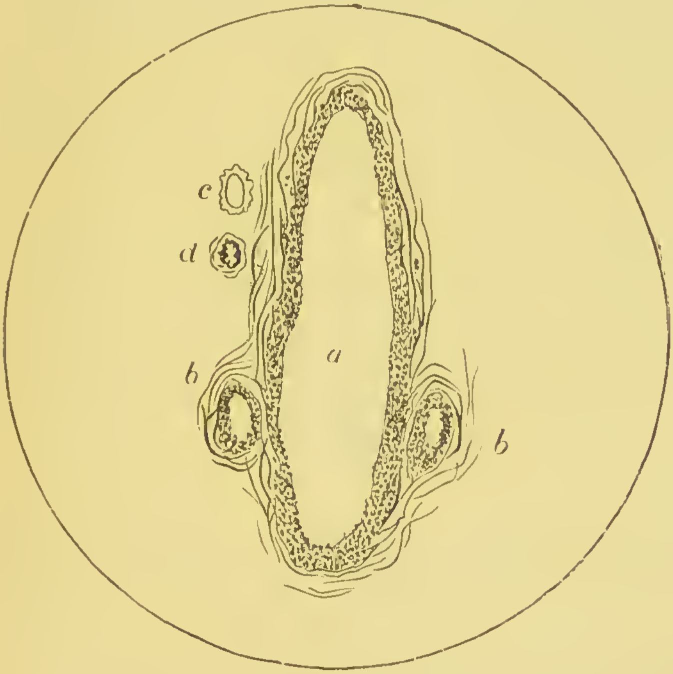

FIG. 25.

TRANSVERSE SECTION OF URETHRA much enlarged (*Skene*).
a Urethral Canal; *b b* Glands described by Skene; *c* Vein; *d* Artery.

Skene's Tubules.

mucous membrane, and in the muscular walls of the urethra." We have in section of the female urethra:—

Mucous membrane;
Submucous layer;
Muscular layer, longitudinal and circular, unstriped;
do. do. striped (*Uffelman*).

External to these, there is the anterior vaginal wall behind, and loose tissue in front.

According to Henle, the closed urethral slit is on section transverse near the bladder, sagittal at the meatus, and star-shaped between these two points.

Bladder Openings.

In the bladder proper we have three openings—the internal orifice of the urethra and the orifices of the two ureters. The latter lie one on each side, about 1½ inches from the internal orifice. These openings give us the landmarks for the division of the bladder into neck, base, and body. All above the lines joining the ureteric openings and the centre of the symphysis is the body; all below is the base, and that portion between the ureteric openings and the internal orifice is the trigone. The trigone is formed by a blending together of the innermost bands of muscular fibre and fibrous connective tissue. Just above the ureters is the *bas fond*.

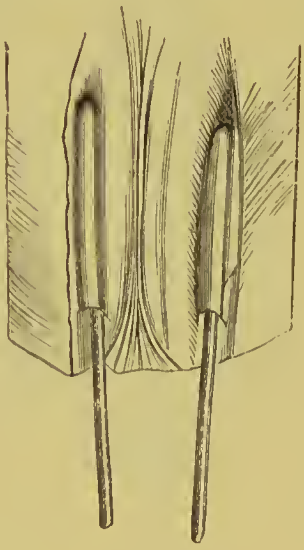

FIG. 26.

URETHRA LAID OPEN from above, showing glands with probes passed in (*Skene*).

Structure of Bladder.

The wall of the bladder is made up of three layers, viz., a mucous, a muscular, and a peritoneal.

The mucous membrane consists of connective tissue lined by several layers of transitional or multiform epithelium (fig. 27). It is arranged in folds, except over the trigone and openings. The folds or rugæ are due to the laxity of the submucous coat. The so-called *detrusor urinæ* consists of two longitudinal bands, about 2 inches wide, on the anterior and posterior surfaces of the bladder. It is disputed whether there is a sphincter at the neck of the bladder. Probably there is not; but the puckering of the mucous membrane at the neck is alleged to have a valve-like function.

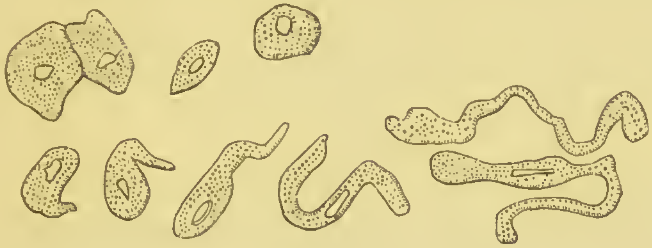

FIG. 27.

EPITHELIAL CELLS from the MUCOUS MEMBRANE of the BLADDER. Those in the upper row are the superficial squamous cells; those in the lower row are the peculiar cells of the middle stratum (*Turner*).

The peritoneal covering of the bladder will be considered subsequently.

Ureters. The relations of the ureters are of importance with regard to inflammatory exudations, fistulæ, and excision of the uterus for cancer and fibroids.

THE URETERS.

The *ureters* (see Pl. I.) are two in number, reaching from kidney to bladder. Each is about 12 inches long, and has an abdominal and pelvic portion.

In the *abdomen* they lie mainly in relation to the Psoas muscles, which they gradually cross obliquely downwards and inwards. On leaving the kidney they are about 1½ inches from the middle line.

At the *pelvic brim* they cross the common iliac artery 1¼ inches from the centre of the promontory, then lie in front of the internal iliac vein and behind the internal iliac artery. They thus follow a somewhat sigmoid course, passing forwards beneath the uterine artery, parallel to the upper part of the vaginal wall (fig. 28) and running between the walls of the vagina and bladder, enter the latter obliquely at the upper and outer limits of the trigone. The uterine artery crosses the ureter about the level of the os externum. On the right side the ureter lies behind the colon and caput coli; on the left behind the sigmoid flexure at and above the brim, and the descending colon higher up.

Shape and Position of Bladder.

Shape of empty Bladder and changes in its position.—The empty female bladder lies completely behind the pubes, and has its fundus covered by peritoneum. When empty and viewed in mesial section it may present one of two shapes. In the large majority of specimens figured, it forms with the urethra a Y shape on sagittal mesial section. The oblique legs of the Y may be about equal in size, or the posterior may be shorter (fig. 29). This form is so common that it has been accepted hitherto by all authors as the normal one. In certain cases, however, but not in so many as the former, the empty bladder cavity forms with the urethra a continuous tube on vertical mesial section (fig. 30). In such cases, it is oval in shape, corrugated, and firm to the touch. This latter shape is the one always found in the lower animals, such as the rabbit and dog, and is the only one seen in the human fœtus. If, therefore, the pelvic floor be viewed on its peritoneal aspect, the fundus of the empty bladder will be found to be very often large and concave, while in some cases it is small and convex. In the former case, the inner surface of the upper segment

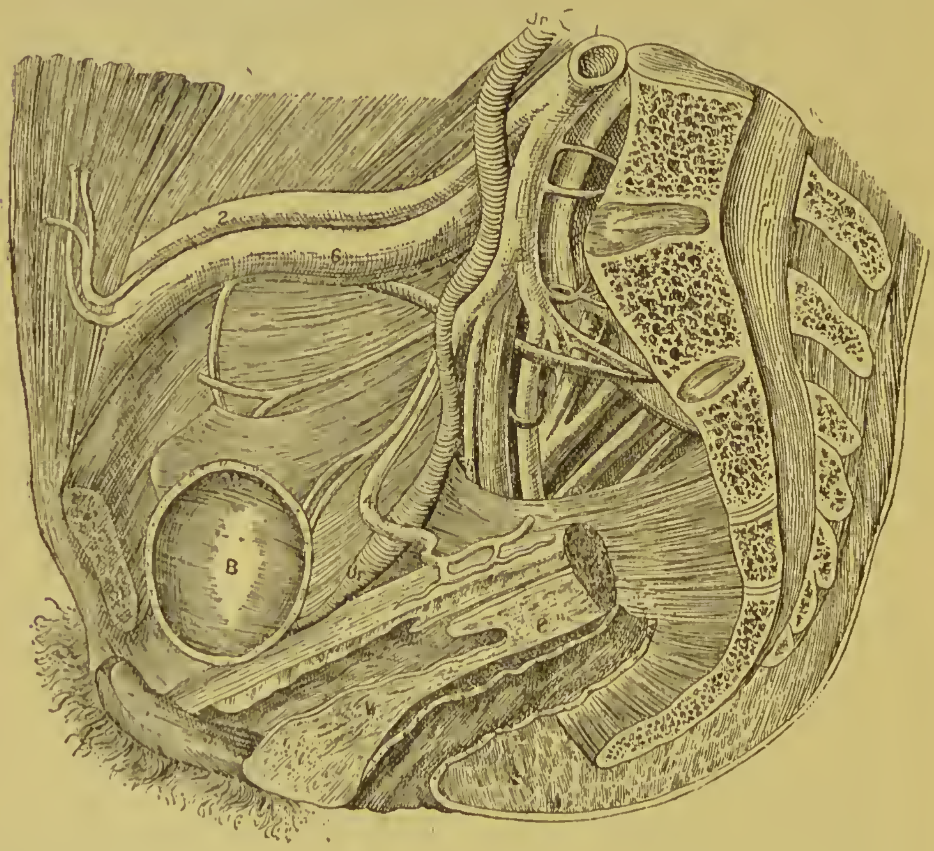

Fig. 28.

Relation of Ureter on the Right Side of a Dissected Pelvis (*Holl*).

V Vagina ; C Cervix ; B Bladder ; Ur, Ur, Ureter.
1 Common iliac artery 2 External iliac artery ; 3 Internal iliac artery ;
4 Uterine artery ; 5 Pudic artery ; 6 External iliac vein.

of the bladder, large in area, is in contact with the surface of the lower segment; in the latter, the anterior and posterior walls, small in area, touch one another.

It is probable that when the bladder has the Y shape on section, it is relaxed and empty (fig. 29), and when the oval shape (fig. 30), it has been caught in systole. The bladder contracts to expel the urine and then relaxes. Between the acts of urination the bladder is therefore only a flaccid sac. Some additional facts as to the position and distention of the bladder are best considered further on, under the structural anatomy of the pelvic floor. We may here state, however, that (1)

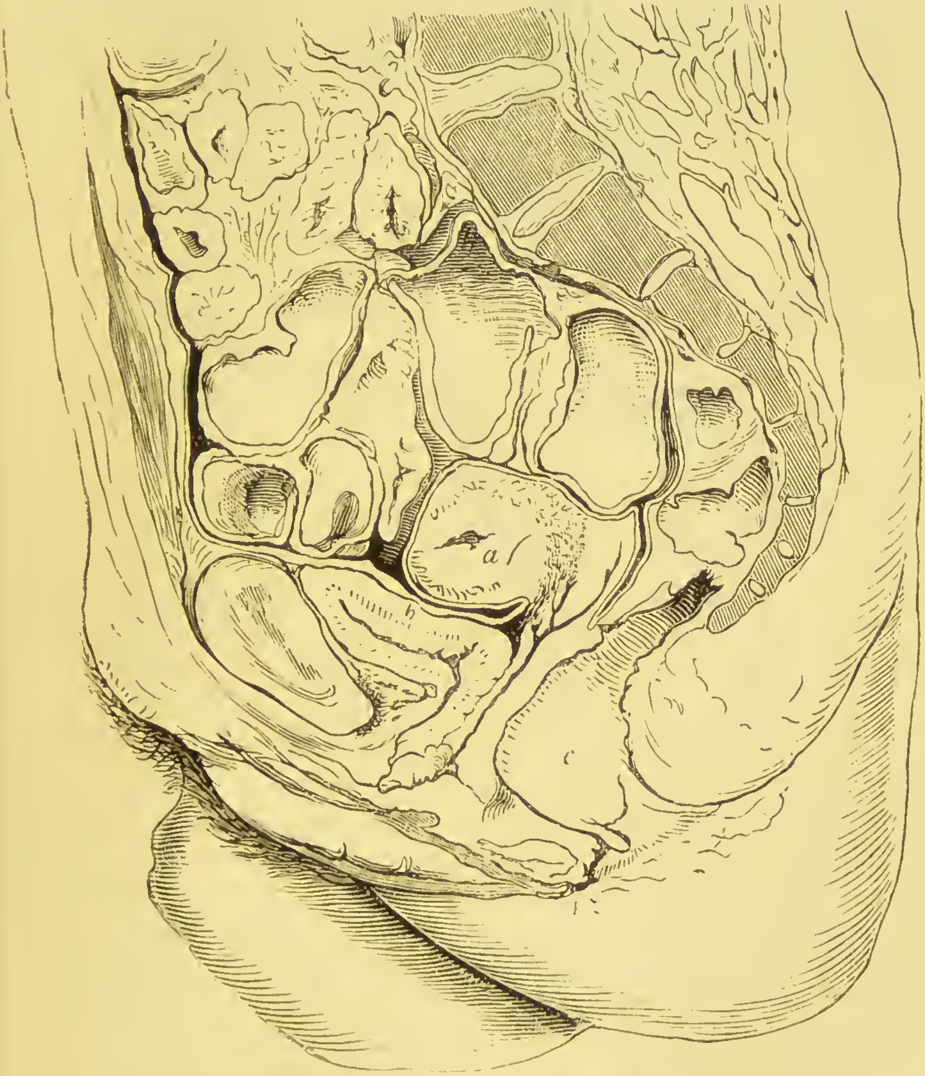

FIG. 29.

VERTICAL MESIAL SECTION OF FEMALE PELVIS, showing Y shape of Bladder (*Fürst*). *a* uterus, *b* bladder, *c* rectum. (½) when empty, in the non-parturient female, it is behind the pubes (fig. 29); (2) it is drawn partly above the pubes in the parturient

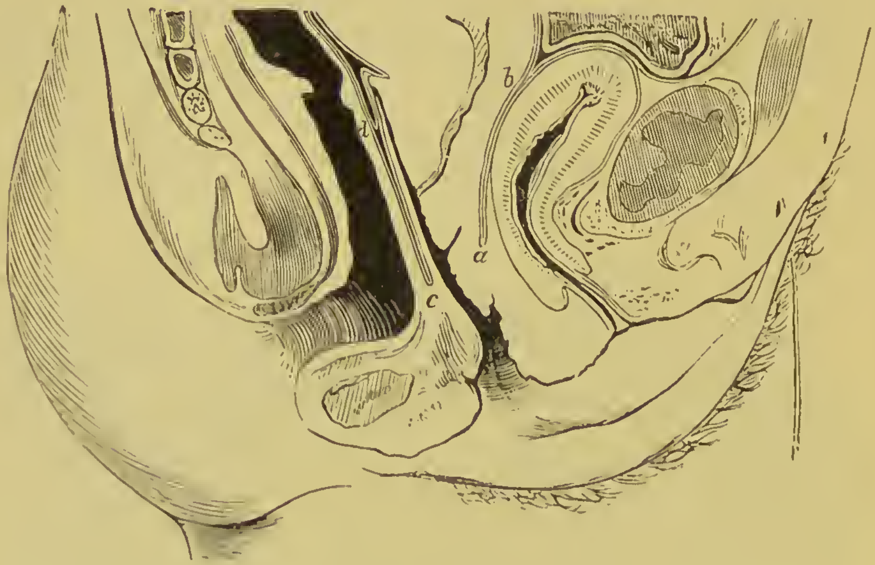

Fig. 30.

Vertical Mesial Section of Female Pelvic Floor, showing contracted bladder in a suicide (*Braune*). The peritoneum descends in front of the uterus to *b* and behind it to *d*; *b a* and *d c* are loose extra-peritoneal tissue. (½)

female (fig. 39); (3) it is tilted above the pubes in retroversion of the gravid uterus.

RECTUM.

Rectum.

The *Rectum* is not separated by any division from the sigmoid flexure, but may be defined as extending from the left sacra-iliac synchondrosis to the anus. It curves downwards, backwards, and inwards, to about the third sacral vertebra. This is known as the first part of the rectum; it is completely covered by peritoneum, which forms the mesorectum. The peritoneum is reflected from the rectum on to the upper part of the vaginal wall, about 3 inches above the vaginal orifice. Thereafter, the rectum lies in relation anteriorly to the posterior vaginal wall to which it is loosely attached until about 1½ inches from the anus.

Micro-scopic Structure of Rectum.

The rectum is made up of peritoneal investment; unstriped muscular fibre in two layers, longitudinal and circular, the former being the outer: a submucous coat; and a mucous lining with its muscularis mucosae, columnar epithelium, no villi, but with Lieberkuhnian follicles closely set together. At the upper limit of the anus, the circular fibres are very well marked, and constitute the sphincter ani internus.

Certain oblique folds in the rectum—consisting of mucous, submucous, and circular unstriped muscular coats—are of special interest. One exists 1½ inches from the anus, another is near the sacral promontory, and one is intermediate (*Turner*). The lowest (the valve of Houston or sphincter ani tertius of Hyrtl) has been described by Chadwick of Boston, as being not an entire circular fold, but made up of two semicircular constrictions, one on the anterior wall, and one on the posterior an inch higher up (fig. 31 *a*).

Anus.

The *Anus* is that part of the rectum at its external orifice. It is about an inch long, and has its long axis directed backwards and cutting the axis of the vagina at about a right angle. The rectum, therefore, when in contact with the posterior vaginal wall closely follows its direction, but at a little above the anus turns sharply backwards. There is thus left between it and the last 1½ inch of the posterior vaginal wall, an angular interspace to be filled up by the structure known as the perineal body.

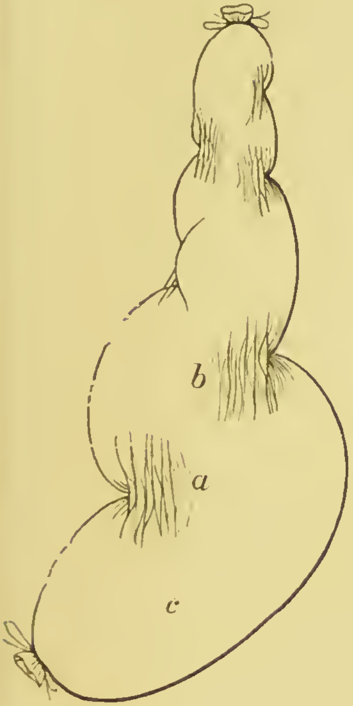

Fig. 31 *a*.

Rectum Inflated (*Chadwick*).
a b Sphincter tertius ; *c* Ampulla of Rectum.

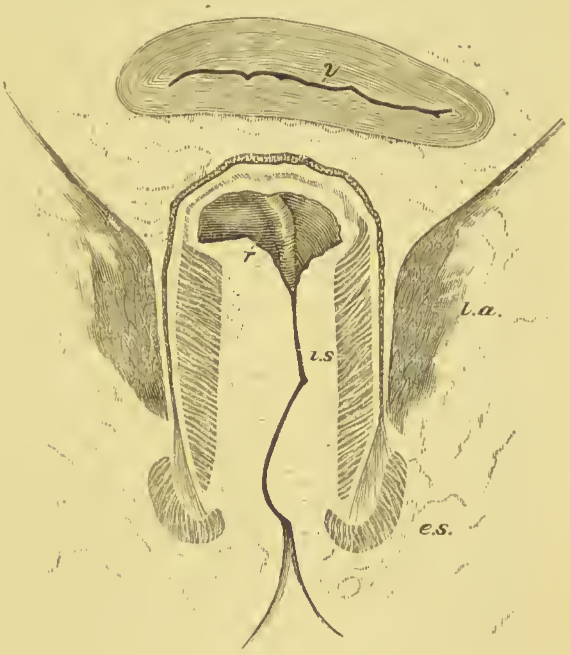

Fig. 31 *b*.

Coronal Section through Anus (*Symington*).
r rectum ; *is* internal sphincter ; *es* external sphincter ; *la* levator ani ; *v* vagina.

During life, the anus is closed by its sphincters in such a way that the lateral walls are in contact (Symington). This explains that the apparent gaping of the anus in sagittal mesial sections is approximately right (*v.* Plate II.).

Near the anal orifice the mucous membrane has certain perpendicular folds in it known as the Columnae Morgagni, with depressions between these—the Sinus Morgagni.

PERINEAL BODY.

Perineal Body.

The posterior vaginal wall is in contact with the anterior rectal wall, for about 1½ inches above the apex of the perineal body, there being only loose tissue between. The *anus* has its long axis directed backwards, while the vaginal axis runs forwards; we thus get a pyramidal space filled up by the structure known as the Perineal body (*Henle* and *Savage*).

The Perineal body is made up of muscular insertions and origins (striped and unstriped), and fibrous and elastic tissue. Its base is covered by the skin lying between the anus and vagina; its anterior side is in great part below the level of the posterior vaginal wall: its posterior side lies in front of the anterior rectal wall and *anus*; while laterally, it is bounded by fat. The voluntary muscles passing into it are the sphincter ani, transversus perinei, bulbo-cavernosus, and levator ani (fig. 6).

This Perineal body measures about 1½ inches (4 cm.) vertically, the same transversely, and ¾ in. antero-posteriorly. If a straight line be made to join the tip of the coccyx and the subpubic ligament, it will just clear the apex of this structure.

Its functions are important, but have been both exaggerated and underrated. Its gives a fixed point for many muscles, prevents pouching of the anus forwards, and strengthens that part of the pelvic floor which has no posterior bony support.

Its special significance, however, will be considered further on.

At present, the nomenclature in regard to the "Perineal region" is exceedingly vague—the term Perineum being used in this general sense by accoucheurs, especially in regard to the tears caused by parturition. It is better to speak of these as tears of the hymen, fourchette, and perineal body, instead of saying "perineal tears." The surface between the anal and vaginal orifices is, strictly speaking, not the perineum but the "skin over the base of the perineal body" and the "fourchette."

PERITONEUM.

Pelvic Peritoneum.

This is the thin serous covering of the concave surface of the pelvic floor and the organs resting on it. A knowledge of its disposition is of the highest importance to the gynecologist. This is best considered as follows.

1. *The Pelvic Peritoneum followed in a Vertical Mesial Section and from before backwards.* The Peritoneum of the anterior abdominal wall is reflected, at a point a little above the symphysis pubis, on to the fundus of the empty bladder (fig. 32). It passes downwards and backwards over the bladder, from which it crosses on to the anterior surface of the uterus at a point about the level of the os internum.

Vesico-uterine Pouch.

From this it passes up over the anterior surface of the uterus. Thus there is formed a vesico-uterine pouch, containing no small intestine either when the bladder is in systole or in diastole (fig. 32). When the bladder has the Y shape in pathological anteflexion, the peritoneum passes directly backwards across the fundus of the bladder and on to the anterior surface of the uterus at or below the level of the os internum. There is thus produced a utero-abdominal pouch.

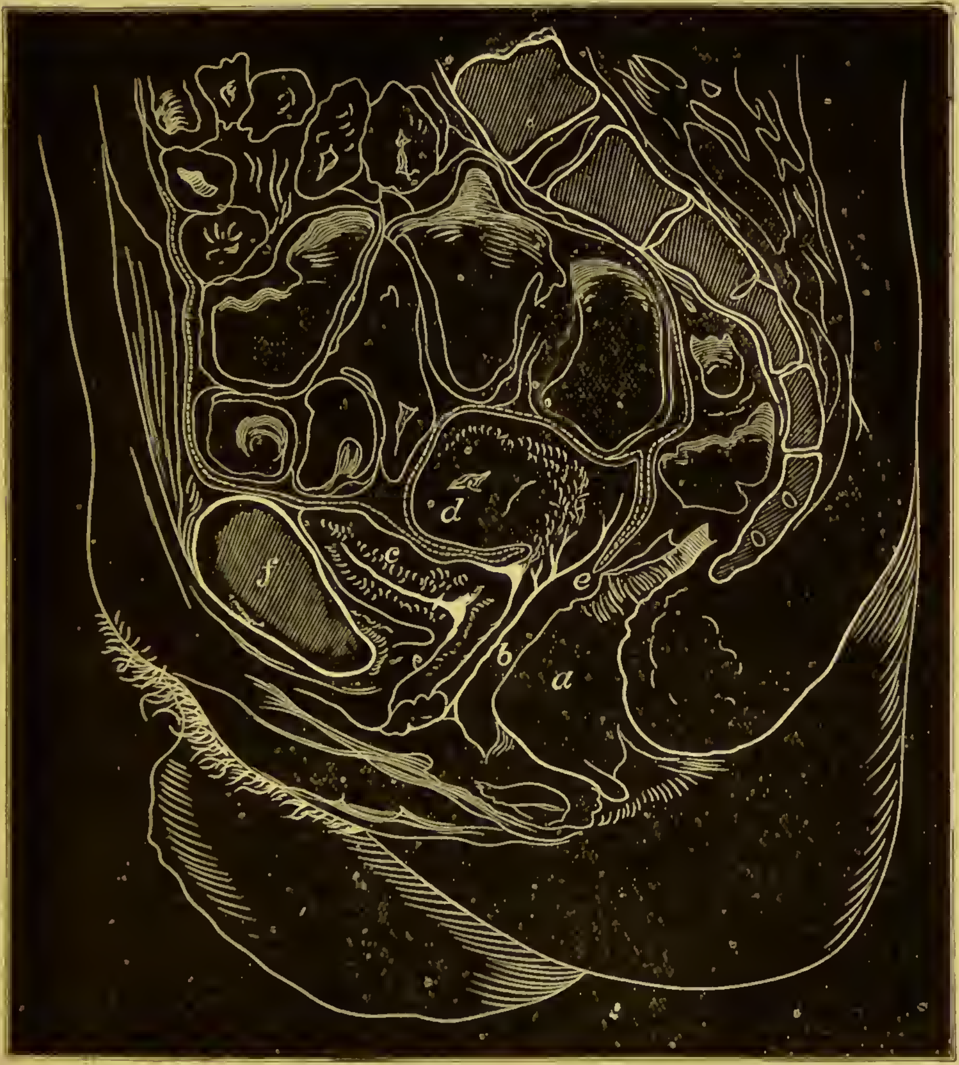

FIG. 32.

FROZEN SECTION showing Peritoneum (*Fürst*). The dotted line indicates Peritoneum in this and fig. 33. *a* Anus; *b* Vagina; *c* Bladder; *d* Uterus; *e* below pouch of Douglas; *f* Symphysis Pubis. (½)

The peritoneum covers the anterior surface of the uterus above the os internum, passes over the fundus, and down the posterior surface of the body and upper third of the cervix. From this it descends still deeper, on to the posterior aspect of the posterior vaginal wall for about half an inch (fig. 32). The depth of the peritoneal pouch formed behind the uterus is greater on the left side than on the right. The amount of its dip varies. In one section by Pirogoff the peritoneum runs down on the posterior vaginal wall till within about an inch from the vaginal orifice. This extent of posterior peritoneal duplicature is abnormal. This variation in depth is quite evident in sections: in some it ends at the level of the posterior fornix, while in others it is seen passing as deeply as has been already described. This descent of the peritoneum behind the uterus is of the highest importance practically, and forms the well-known pouch of Douglas. This pouch is defined as follows: Its upper lateral boundaries are the utero-sacral ligaments; its anterior boundary is the uppermost half inch of the posterior vaginal wall and posterior aspect of the supra-vaginal portion of cervix; its posterior boundary is the sacrum and rectum, covered by peritoneum. It is the lowest part of the peritoneal cavity, and from its relation to the posterior vaginal wall can be explored through the posterior vaginal fornix. It is partially filled by intestine when the uterus lies to the front, which becomes displaced when the uterus is retroverted or retroflexed.

Pouch of Douglas.

Broad Ligaments.

2. *The Disposition of the Pelvic Peritoneum at the sides of the Uterus: Broad Ligaments.*—At the sides of the uterus, the peritoneum clothing its anterior and posterior surfaces passes outwards and somewhat backwards to the side of the pelvis in front of the sacro-iliac synchondrosis. In this way we get two laminæ of peritoneum nearly in apposition, which become more separated at their junction with the pelvic floor and sides of the pelvis; the space between the laminæ is, at its outermost part, in relation to the obturator internus muscle. These are the broad ligaments of the uterus. The posterior lamina has the larger area, and has its outer part applied to the pelvic side wall.

Immediately within their upper free margin, the Fallopian tubes are placed. That part of the free margin not occupied by Fallopian tube forms the infundibulo-pelvic ligament of the ovary (fig. 18 and Pl. II.). Projecting through the posterior lamina of the broad ligament is the ovary, covered by its germ-epithelium. The ovarian ligament and parovarium have already been described under the ovary and Fallopian tube.

Between the layers of the broad ligament lie connective tissue, unstriped muscle, blood-vessels, and lymphatics. According to M. Guérin, the broad ligaments enclose a small space shut off from the rest of the cellular tissue of the pelvis, and he denies that as yet there is proof of any special diagnosable inflammatory affection of the broad ligaments. Guérin alleges that, by inflation, it can be demonstrated that the broad ligaments are thus shut off—a fact denied by other observers.

The position of the broad ligaments varies according to that of the uterus. When the uterus is normal in position, *i.e.*, lying to the front, their posterior surfaces look upwards and somewhat backwards, and they run outwards and backwards as already described. Displacement of the uterus backwards causes their coincident displacement, and in pregnancy they are drawn up and lie almost vertically. Pathologically, they cicatrize after inflammatory attacks and cause unilateral deviations of the uterus.

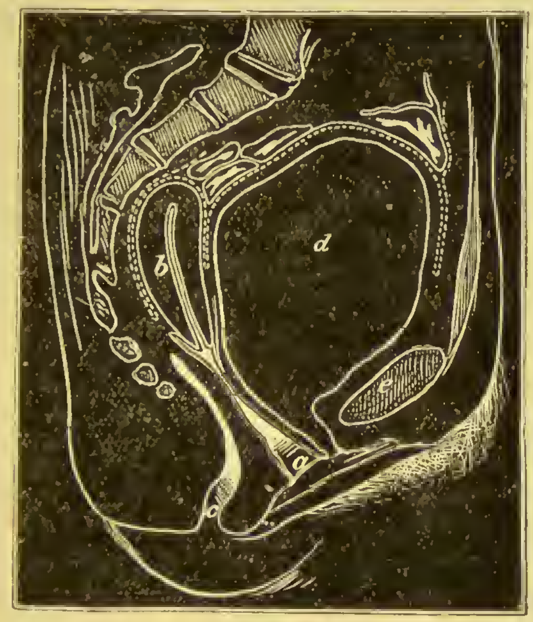

Fig. 33.

Relation of Bladder and Peritoneum when Bladder Distended (*Pirogoff*).
a Vagina; *b* Uterus; *c* Anus; *d* Bladder; *e* Symphysis.

Peritoneum on side walls of Pelvis.

3. *The Pelvic Peritoneum on the side walls of the Pelvis.*—The pelvic peritoneum clothes the side walls of the pelvis. It dips down least at the sides of the bladder, and most at the utero-sacral ligaments.

Although the pelvic peritoneum has been described in three sections, it must of course be kept in mind that it is a continuous membrane with no breaks in its continuity.

Some special facts about the peritoneum should now be noted.

Relation to Bladder and Rectum.

1. *As to the Bladder.*—Over the bladder and anterior abdominal wall, the peritoneum is easily separable. According to Spiegelberg, posteriorly it is closely blended with the uterus above the

os internum, below this quite loosely attached. When the bladder is distended, the peritoneum is stripped off the lower part of the anterior abdominal wall to an extent varying with the distention (fig. 33). During parturition, the peritoneum is drawn off the bladder (*Hart*).

2. *As to the Rectum.*—Its upper part is completely invested by peritoneum; the second part is only partially covered, *i.e.*, the peritoneum gradually leaves the rectum, quitting first the posterior surface, then the sides, and finally passing from the anterior surface on to the posterior vaginal wall.

See also Chapter II. on The Sectional Anatomy of the Female Pelvis, and especially Chapter III., p. 54.

Peritoneum in relation to operations.

Practical Points.—Although the vesico-uterine pouch can be reached by a transverse incision through the anterior fornix, it will not be cut into in operations on the anterior vaginal wall. In the upper third or so of the posterior vaginal wall the peritoneum may be opened into. When the fingers are passed into the posterior fornix vaginæ, only about ⅓ inch of tissue intervenes between them and the peritoneum.

CONNECTIVE TISSUE OF PELVIS.

By this we understand (I.) the Fascia described so elaborately by the human anatomist as the Pelvic Fascia; and (II.) the loose Connective Tissue padding the interstices between the muscles, lying round the cervix uteri, and spreading out beneath the pelvic peritoneum.

Pelvic Fascia.

I. The *Pelvic Fascia* of the anatomist is carefully described in the ordinary systematic and dissecting-room manuals, to which the student is therefore referred (*v.* also p. 10 and Chap. II.).

Pelvic Connective Tissue.

II. The *loose connective tissue* found lying subperitoneally, surrounding the cervix uteri and spreading out between the layers of the broad ligament, is of the highest importance pathologically, as in it and in the pelvic peritoneum occur those inflammatory exudations so common in women. Of late years our knowledge of the disposition of this tissue has been rendered much more accurate, and accordingly our discrimination of pelvic inflammatory attacks made much more precise.

Methods of studying it.

The distribution and relations of the pelvic connective tissue may be studied in various ways. The most valuable information is obtained by considering sections of frozen or spirit-hardened pelves. This gives the precise position of the tissue, its amount, and distribution. Another valuable method of investigation is to inject air beneath the peritoneum, between the layers of the broad ligament, and at other points. By this we learn the varying attachments of the pelvic peritoneum to the subjacent tissue, and the lines of cleavage, as it were, of the pelvic connective tissue, along which pus will burrow. Instead of air we may inject plaster of Paris or water; plaster of Paris will be found the most useful.

We therefore consider—

a. Results obtained by the injection of water, air, plaster of Paris;
b. Results obtained by section.

a. Results obtained by injections of water, air, or plaster of Paris.

The best summary of these results is given by Bandl, to whom on this point we are indebted for much valuable information.

Connective Tissue investigated by injections.

König in his researches employed the bodies of women who had died a short time after labour from non-puerperal diseases, and injected air or water. The following briefly are his results:—

(1.) Water injected between the layers of the broad ligament, high up in front of the ovary, passed first into the tissue lying at the highest part of the side wall of the true pelvis. It then passed into the tissue of the iliac fossa, lifting up the peritoneum, and followed the course of the psoas, passing only slightly into the hollow of the iliac bone. Lastly, it separated the peritoneum from the anterior abdominal wall for some little distance above Poupart's ligament, and from the true pelvis below it.

(2.) On injection beneath the base of the broad ligament to the side and in front of the isthmus, the deep lateral tissue became filled first; then the peritoneum became lifted up from the anterior part of the cervix uteri. The separation passed thence first to the tissue near the bladder, and ultimately the fluid passed along the round ligament to the inguinal ring. There it separated the peritoneum along the line of Poupart's ligament, and passed into the iliac fossa.

(3.) An injection at the posterior part of the base of the broad ligament filled the corresponding tissue round Douglas' pouch, and then passed on as described at (1.).

Schlesinger has followed out these results in more elaborate researches.

b. Results obtained by section.

The Sectional Anatomy of the Pelvis has now become a subject of such importance that it demands consideration in a separate chapter. The student will find at pp. 47-49, reference made specially to the distribution of the connective tissue.

CHAPTER II.

THE SECTIONAL ANATOMY OF THE FEMALE PELVIS.

LITERATURE.

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While dissections are valuable in ascertaining the anatomy of any region, it must be remembered that they involve displacement of relations, and therefore may lead into error or exaggeration. These may be corrected and additional accuracy obtained by making sections of frozen bodies or parts of them. If a body or a pelvis be covered with mackintosh and embedded in a mixture of salt and finely pounded ice or snow, it will in three or four days become as firm and solid as marble, and may then be sawn in any direction necessary. Tracings of the sawn surface may be made while it is still frozen; and in this way an accurate and trustworthy drawing may be obtained, on which valuable measurements can be made.

We have said that the sections may be sawn in any direction, but usually they are made in special and definite lines, as follows:—

(1.) *Sagittal Mesial, i.e.*, parallel to the sagittal suture, so that the body or pelvis is divided into right and left halves;

(2.) *Sagittal Lateral, i.e.*, parallel and to one or other side of the sagittal mesial plane;

PLATE II.

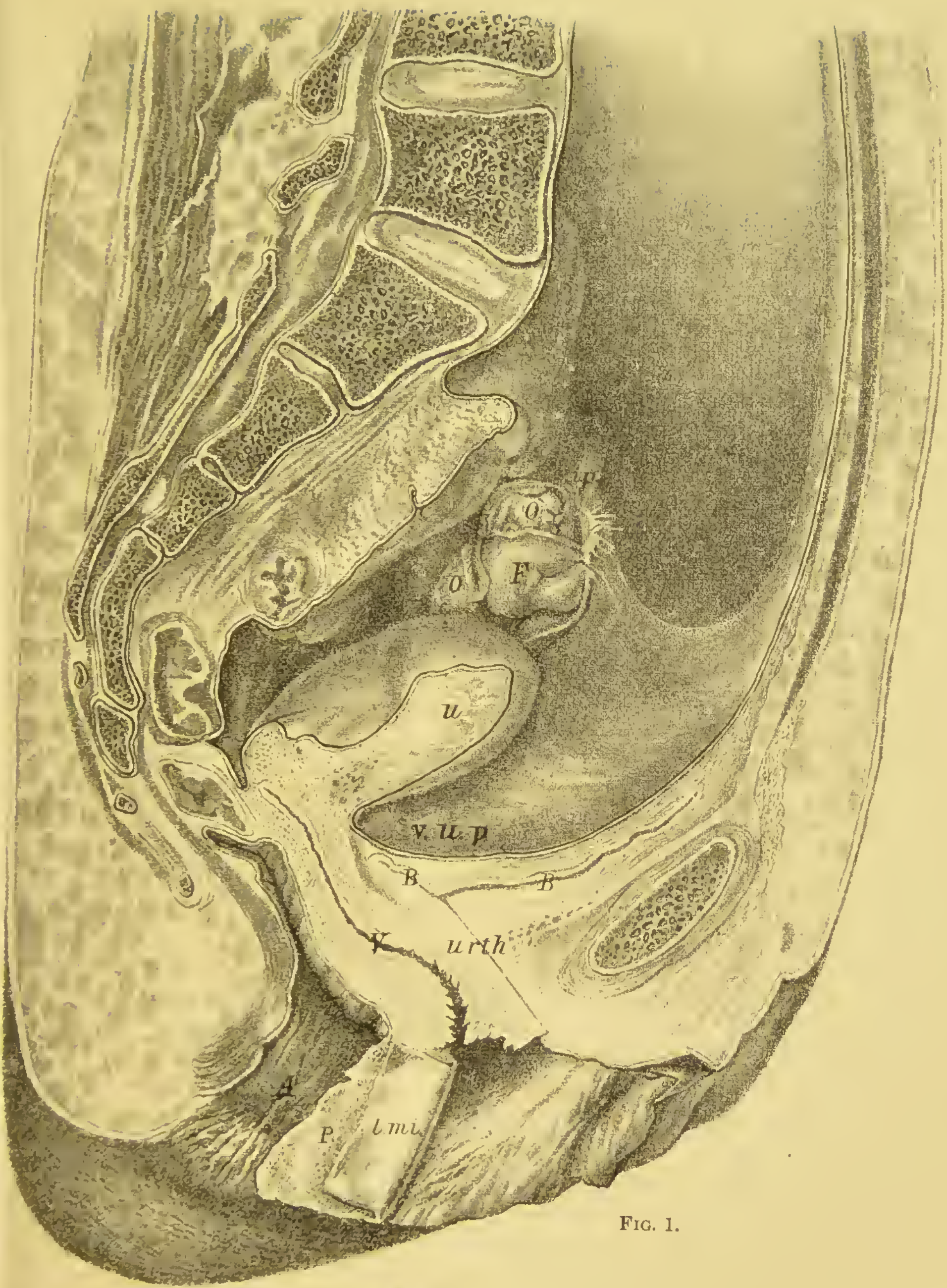

FIG. 1.

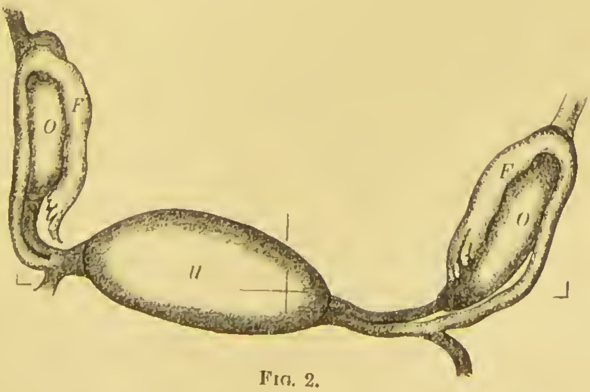

FIG. 2.

W. & A. K. Johnston Limited, Edinburgh & London

POSITION OF UTERUS AND OVARIES.

FIG. 1. Sagittal Mesial Section of Pelvis (*Hart*).

FIG. 2. Fundus Uteri and Ovaries—Seen through the Pelvic Brim (*His*).

(3.) *Transverse or Horizontal*, *i.e.*, at right angles to the long axis of the body, and with surfaces upper and lower;

(4.) *Coronal*, *i.e.*, parallel to the coronal suture, dividing the body or pelvis into anterior and posterior portions, with surfaces anterior and posterior.

We now take up the consideration of certain special sections.

1. *Sagittal Mesial Section.*

Sagittal Mesial Section.

Plate II., fig. 1, shows a frozen sagittal mesial section of the pelvis with the uterus in position, the bowel and bladder naturally empty and the small intestine removed from the pouches so as to display the Fallopian tube and ovary. This section brings out the following facts: the uterus is not mesial but displaced somewhat to the left; the empty bladder is Y shaped in sagittal mesial section; the urethra, vagina, and rectum are nearly parallel to one another and to the conjugate of the brim; the anus cuts these axes at right angles. The intestines have been removed from the pouch of Douglas and vesico-uterine pouch. The nearness of the anterior abdominal wall to the promontory of the sacrum is well shown. The Perineal body is seen in section, and it should be noted that the greater part of it lies below the Hymen. Those gynecologists who exaggerate its functions usually draw it as being entirely behind the lower part of the posterior vaginal wall. Plate II. and fig. 20 show that it does not do this. The student should note the peritoneal relations.

Plate II. also shows the relations of the Fallopian tube and ovary. When freshly cut, the intestines filled the peritoneal cavity; but after the section had been hardened in spirit, these were carefully lifted out so as to expose the ovary and Fallopian tube. The ovary lies with its long axis vertical, as His has pointed out. The preparation bears out his views completely with regard to the position of the ovaries, for on the other side of the body the ovary has its long axis somewhat transverse; and he has found that when the uterus was laterally displaced, the ovary of the side towards which the uterus was displaced lay vertical, while the other ovary was somewhat transverse. In this cadaver the uterus lay to the left side, and it is the left ovary which has its long axis vertical. The Fallopian tube does not form a loop enclosing the ovary, as His found in his specimens (Plate II., fig. 2).

2. *Sagittal Lateral Section.*

Sagittal Lateral Section.

By this section a specially valuable view is obtained. Fig. 34 shows a drawing of a section at the junction of the uterus and broad ligaments; in it, although the pubes is divided mesially, the pelvic contents are cut to one side of the mesial plane. It should be noted that the

Connective Tissue of Broad Ligaments.

amount of retropubic tissue is less than in the sagittal mesial one; that at the junction of the broad ligaments with the uterus there is a large amount of tissue with large blood-vessels; and specially that the finger placed in the lateral fornix vaginæ touches the base of the broad ligament there. This fact is valuable as to diagnosis. On section, the boundaries of the space between the broad ligaments are seen: superiorly the cut section of the Fallopian tube, anteriorly and posteriorly the peritoneum, and inferiorly the vaginal fornix. The assertion by Guérin and Le Bec as to the insignificance of the tissue here is not borne out.

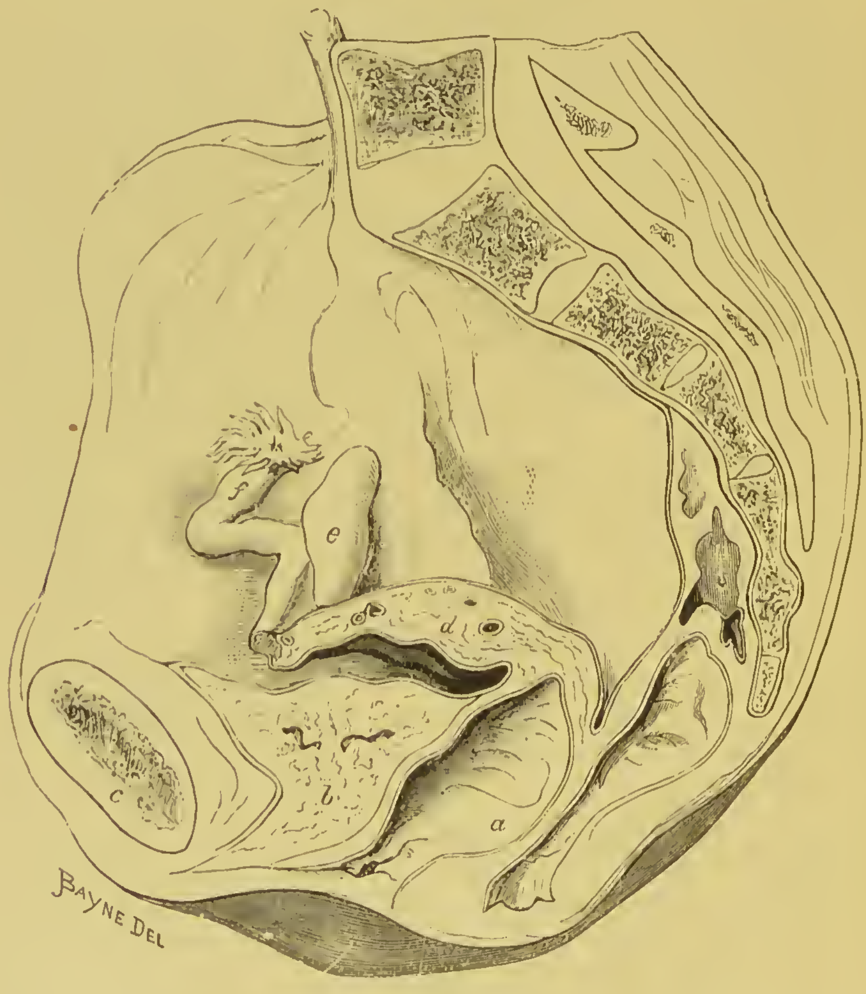

FIG. 34.

SAGITTAL MESIAL SECTION OF PELVIS cutting at junction of Broad Ligament and Uterus.
a Vagina with its walls separated; *b* Bladder; *c* Symphysis; *d* Broad Ligament; *e* Ovary; *f* Fallopian Tube. In this specimen the Uterus was laterally displaced.

Sections made nearer the side pelvic wall display specially the lessening tissue between the layers of the broad ligaments and show sections of the ovary.

3. *Transverse or Horizontal Section.*

Pelvic Connective Tissue—as seen in Horizontal Section.

These give results confirming those above stated. Pirogoff gives several sections in his Atlas, but these are not clearly defined in their connective-tissue relations. Freund has published a very valuable series of preparations in his Gynäkologische Klinik. The most valuable sections are those at the level of the supra-vaginal portion of the cervix, which show the tissue lying here all round it.

Parametric Tissue.

This is the best place to draw special attention to what Virchow first termed the parametric tissue. By this term he meant the loose fatless tissue (·8 in. thick), with abundant blood-vessels and lymphatics, surrounding "the lower portion of the uterus and the upper portion of the vagina" (*Spiegelberg*). This is the parametric tissue proper. Some extend the meaning of the term parametric tissue so as to include all the connective tissue in the pelvis.

CHAPTER III.

THE POSITION OF THE UTERUS AND ITS ANNEXA, AND THE RELATION OF THE SUPERJACENT VISCERA.

LITERATURE.

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The amount of literature, chiefly French and German, on this subject is much too extensive even to be mentioned here, for the position of the uterus has given rise to much discussion. This is partly due to the inherent difficulty of accurate clinical observations, to the erroneous opinions advanced by many eminent anatomists, and to arbitrary demands as to the normal uterine position made by gynecologists with strong opinions on anteversion.

Difference in opinions as to position of Uterus.

Thus, in the well-known works of Braune, Luschka, Cruveilhier, and Henle, the uterus is figured from actual sections as normal with the fundus in the hollow of the sacrum, *i.e.*, retroposed. Claudius of Marburg, also an anatomist, is uncompromising on this point. He states, indeed, that the uterus is normal only when, with its broad ligaments, its posterior surface touches the sacrum as closely as the lungs do the ribs. Now, almost all gynecologists agree, from clinical observation, that the body of the uterus lies over on the bladder, with the os uteri looking more or less back. This divergence of opinion is extraordinary; and it leads to this interesting practical observation, that what the anatomist considers a uterus normal in position, the gynecologist believes to be abnormal. That is, the retroverted uterus—considered normal in cadavera by the anatomist—is, in certain cases, when found in the living subject, replaced by the gynecologist so that it lies with its body over the bladder.

There can be no doubt that the uterus lies normally to the front with its anterior surface resting on the bladder. Great refinement is exercised, quite unnecessarily, by many gynecologists in settling what they believe to be the exact angle which the long axis of the uterus should make with the horizon, when a woman is in the erect posture; and this refinement has been greatly stimulated by the mechanical treatment of what is known by many as anteversion of the uterus.

In treating of this vexed question, we shall consider—

1. The normal form and position of the uterus;
2. The local divisions of the pelvic-floor peritoneum as viewed through the pelvic brim, and the position of the uterus and its annexa;
3. The physiological changes in the position of the uterus;
4. The relation of the small intestine to the pelvic floor and to the uterus and its annexa.

THE NORMAL FORM AND POSITION OF THE UTERUS.

Normal form of Uterus.

The question of the *form* of the uterus we consider only in the limited aspect of the angular relation of the long axis of the uterus to the long axis of the cervix. These are not in the same straight line, but, when the bladder and rectum are empty, lie at an obtuse angle of varying value. This angle is more open in multiparous women (fig. 22), than in nulliparæ (fig. 35).

The question as to whether in the normal uterus the cervix and body are in the same straight line or meet at an angle opening anteriorly, is much disputed and by no means easy to settle. Bimanually, the normal uterus is fairly often found anteflexed, but the question arises whether the Bimanual examination has not brought about or at any rate exaggerated the anteflexion. Bandl asserts that when the uterus is removed and examined *post-mortem*, anteflexion is rarely found, the normal uterine axis being straight. It should be remembered however that the removal of the uterus from the body involves the cutting of the utero-sacral ligaments and the absence of intra-abdominal pressure, *i.e.*, removes the conditions in the living subject which keep up "physiological anteflexion"; so that a uterus somewhat anteflexed during life may be straightened by removal *post-mortem*. The best way to ascertain the existence of anteflexion in the living woman is to use simple vaginal examination. The question really is as to the normal form of the uterus in the living woman with the peritoneal folds intact and intra-abdominal pressure in action. Under these conditions there is a normal degree of anteflexion which is called "Physiological anteflexion," in contrast with Schultze's "Pathological anteflexion," so commonly caused by utero-sacral cellulitis (*v.* also Chap. on Displacements of the Uterus).

Normal position of Uterus.

The *position* of the uterus, with empty bladder and rectum, is such that it lies with its anterior surface touching the posterior aspect of the bladder, no intestine usually intervening; the os externum uteri looks downwards and backwards; and the uterus is slightly twisted as a whole on its long axis, so that the uterine end of the right Fallopian tube is nearer the symphysis than that of the left. We have expressly said with bladder and rectum empty. According to Schultze, the long axis of the uterus is nearly parallel to the horizon. This is probably exaggerated, as Schultze's researches were conducted in a way that certainly anteverted the uterus unduly (figs. 22 and 35). Many authors figure the uterus nearly vertical to the horizon, for this purpose distending the bladder until the uterus is elevated to what they consider the proper angle (fig. 36). It is needless to say how absurd this is. Kohlrausch's diagram, so often quoted in support of this allegation, really shows, if it show anything, the position of the uterus when the bladder is well distended. The student should note this point, as Kohlrausch's section

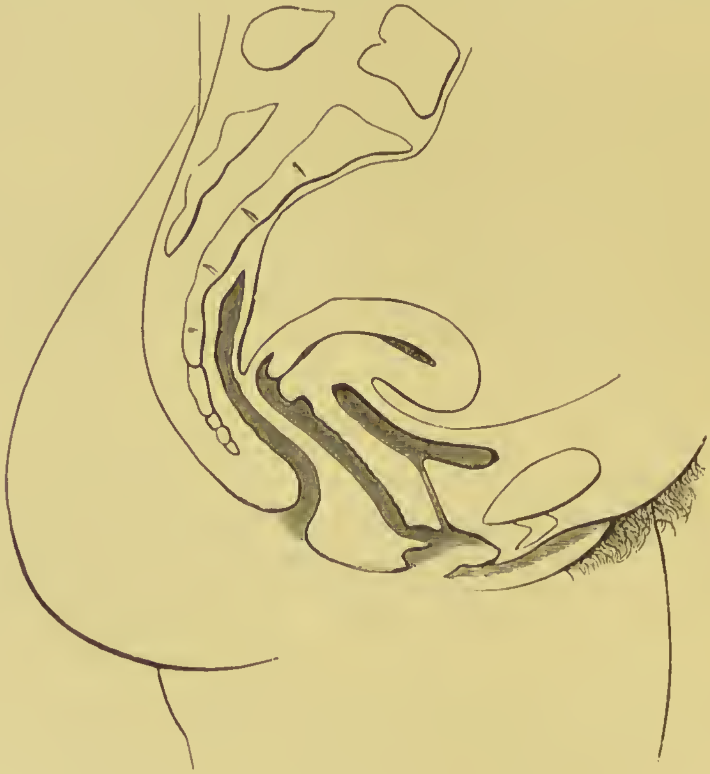

FIG. 35.

DIAGRAM to show Normal Form and Position of VIRGIN UTERUS (*Schultze*).

is the favourite diagram of those who treat as pathological what is really a normal uterus.

It is important to know how results as to the uterine position have been obtained. The chief methods are as follows:—

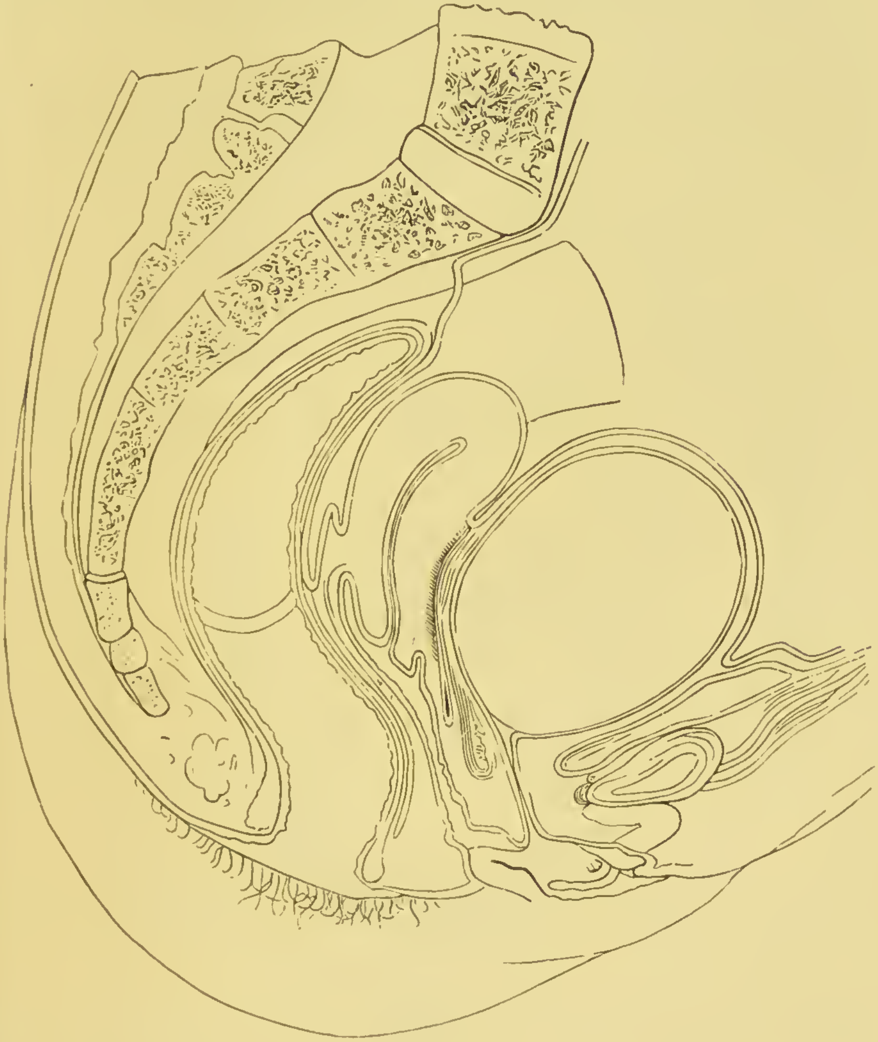

FIG. 36.

SECTION OF PELVIS, showing UTERUS driven back by distended Bladder, and Peritoneum disturbed (*Kohlrausch*). *This is not a normal condition of parts by any means.*

Methods of investigating position of Uterus

(1.) *By frozen, spirit-hardened, or formalin sections.*—Results obtained in this way are valuable, if we make allowance for some *post-mortem* change in the uterine position not yet thoroughly understood.

(2.) *By the bimanual examination of the pelvic contents.*—This is probably the best method, although it exaggerates the normal anteversion of the uterus in a way that will be readily understood when the chapter on the Bimanual has been studied.

(3.) *By the use of the sound*, or by a more elaborate means described by Schultze. Space does not permit of a full description of the latter but a good account of it is given in Foster's paper.

THE LOCAL DIVISIONS OF THE PELVIC-FLOOR PERITONEUM AS VIEWED THROUGH THE PELVIC BRIM, AND THE POSITION OF THE UTERINE ANNEXA.

For valuable papers and sections on this subject, we are indebted to Hasse, Waldeyer, and others (fig. 37). Hasse froze not quite thoroughly a female cadaver in the upright posture, cut through the abdomen

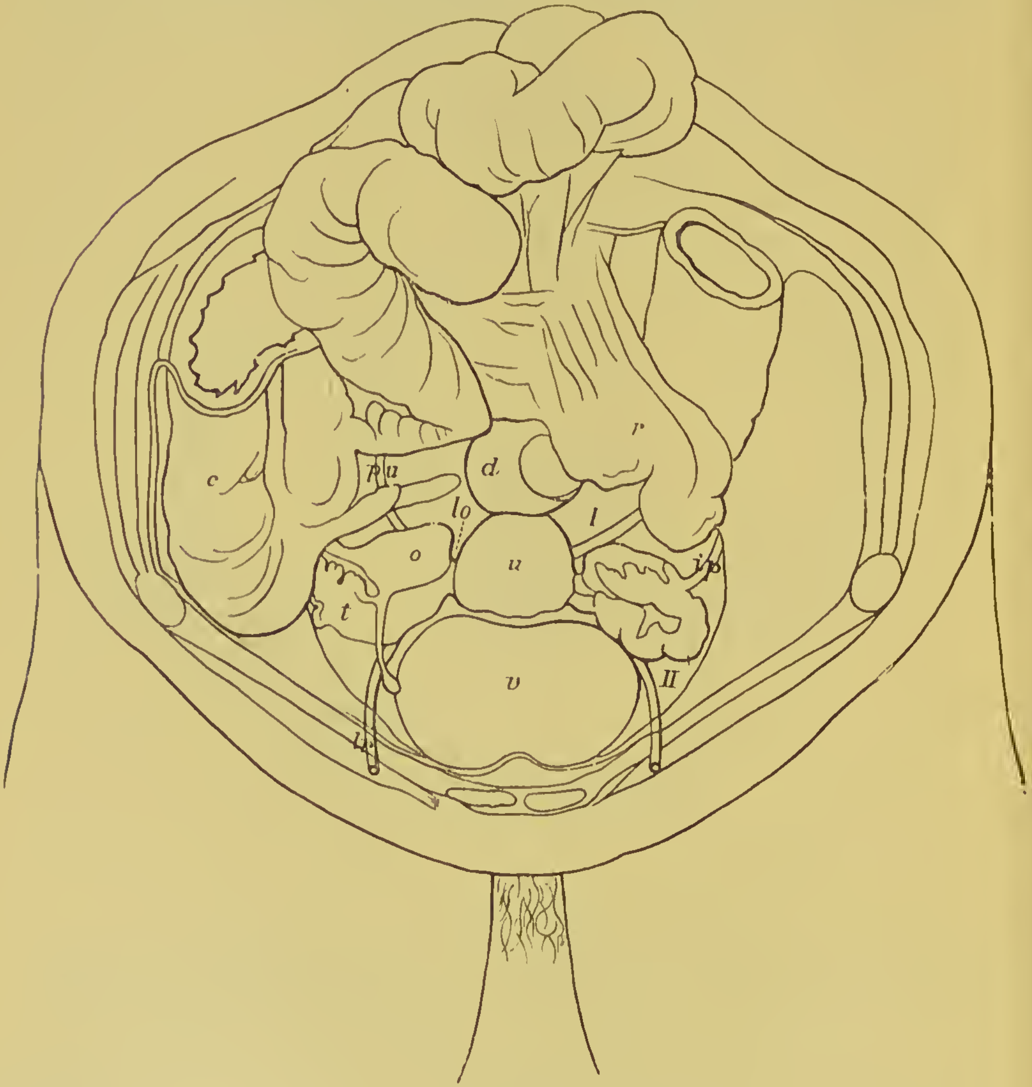

FIG. 37.

FEMALE PELVIS and CONTENTS viewed through the Pelvic Brim (*Hasse*).

v Bladder; *II* Paravesical Pouch; *u* Uterus; *o* Ovary; *t* Fallopian Tube; *d* Pouch of Douglas; *l* Lateral Pouch of Douglas; *ip* Infundibulo-pelvic Ligament; *lr* Round Ligament; *pu* Position of Ureter; *lo* Ovarian Ligament; *r* Rectum; *c* Colon.

transversely, and then lifted out the softened viscera until the pelvic contents were exposed undisturbed. The bladder was moderately distended.

Pelvic Contents as seen through the Brim.

Fig. 37 shows Hasse's drawing. The fundus of the uterus lying on the bladder is well seen. In front of the broad ligament—of which the infundibulo-pelvic ligament is the only portion visible in fig. 37—we have, on each side, the paravesical pouch of the peritoneum. Behind it lies the lateral pouch of Douglas; while just behind the uterus, and bounded on each side by the utero-sacral ligament, is the pouch of Douglas proper. The Fallopian tubes lie in the true pelvis, in the paravesical pouch. Each broad ligament sweeps outwards and backwards to near the sacro-iliac synchondrosis of its own side. The position of the ureter is well indicated.

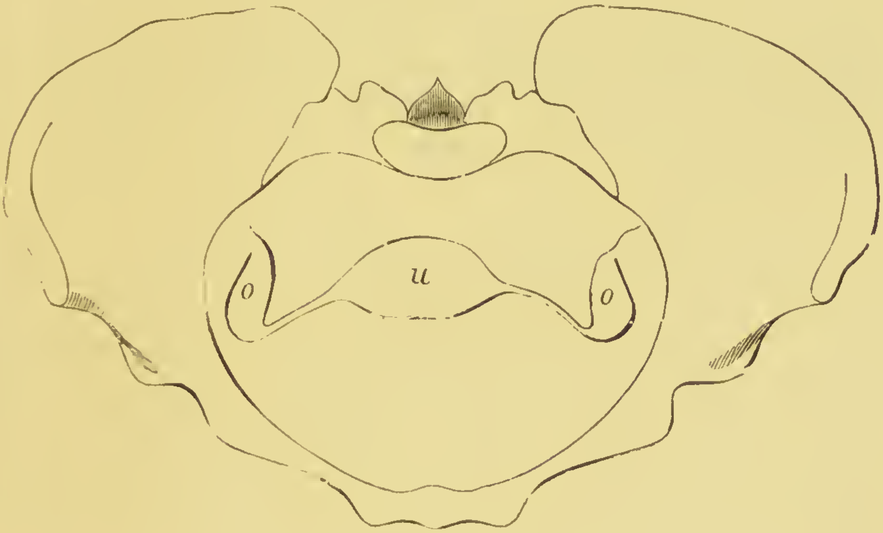

FIG. 38.

POSITION OF FUNDUS UTERI and lie of OVARIES. Bladder distended (*Schultze*).

Direction of Ovaries.

According to Hasse the long axis of each ovary runs outwards and forwards, forming with the transverse axis of the uterus an angle open to the front. Part of each ovary (the half) projects above the plane of the pelvic brim. Schultze figures the ovaries as having their long axes almost antero-posterior (fig. 38), and His in his cases found the long axes nearly vertical. In recent sections, the authors found the ovary lying nearly vertical as His describes (*v.* Pl. II.). The long axis of the ovary on the side to which the uterus is displaced is nearly vertical, while the ovary of that side from which the uterus is displaced is more transverse (*v.* p. 25, and Pl. II., fig. 2).

THE PHYSIOLOGICAL CHANGES IN THE POSITION OF THE UTERUS.

The mobility of the uterus is one of its most characteristic features. With every movement of respiration—in singing, in walking, and in all violent movements—the uterine position is changed. Van de Warker has studied, in a valuable paper, the influences bringing about these changes in position; this may be consulted for details of his method of investigation and results obtained.

Effect of Bladder on position of Uterus.

Of the greatest importance is the effect of the distended bladder on the uterine position. As the bladder fills, the uterus becomes retroposed to an extent shown at figs. 36 and 37. The intestines are forced out of the upper part of Douglas' pouch, and the height of the peritoneal reflection from the anterior abdominal wall is considerably increased. All these points are well illustrated by fig. 33 from Pirogoff. As the urine is evacuated, the uterus passes forward to its normal anteverted condition, and the intestines pass back into Douglas' pouch. Rectal distension displaces the uterus forwards and to the right side.

THE RELATION OF THE SMALL INTESTINE TO THE PELVIC FLOOR AND TO THE UTERUS WITH ITS ANNEXA.

Relation of small Intestines to Uterus.

The small intestine lies resting on the uterus, ovaries, Fallopian tubes, and broad ligaments. There is usually no small intestine in the vesico-uterine pouch. *When the bladder is empty and the unimpregnated uterus to the front, there is small intestine in Douglas' pouch except at its very lowest part.* The pouch of Douglas becomes emptied of intestine as the bladder distends, and has no intestine in it when the uterus is retroverted. Many authors assert that there is never small intestine in Douglas' pouch. This opinion is undoubtedly wrong, as anyone can satisfy himself by studying sections. Often Douglas' pouch contains serum, and this displaces the intestine. Figures 32 and 33 bear out these opinions. The paravesical pouch probably contains intestine when the uterus lies to the front, and certainly contains it when the uterus is pathologically retroverted. Occasionally the omentum may interpose between the small intestine and the pelvic viscera.

To sum up briefly:—

Summary as to position of Uterus.

a. The uterus and bladder behave practically as one organ *quâ* position (*i.e.*, they move together), when the uterus is to the front.

b. The exact angle which the uterus makes with the horizon cannot be fixed, and knowledge on this point is not necessary.

c. The uterus lies normally to the front, but has a certain range of mobility. The posterior lip of the cervix is ·6 to 1·2 in. (1·5 to 3 cm.) above the tip of the coccyx. By digital pressure the uterus can be raised considerably.

CHAPTER IV.

THE STRUCTURAL ANATOMY OF THE FEMALE PELVIC FLOOR.

LITERATURE.

STRUCTURAL ANATOMY. *Hart*—The Structural Anatomy of the Female Pelvic Floor: Edinburgh, 1881. Atlas of Female Pelvic Anatomy: 1884. Supplement to ditto: 1885. W. & A. K. Johnston, Edinburgh and London. *Symington*—A Contribution to the Normal Anatomy of the Female Pelvic Floor: Edin. Med. Jour., March, 1889.

Structure of Pelvic Floor with regard to function.

HITHERTO we have regarded the pelvic floor in detail as made up of bladder, vaginal walls, rectum, connective tissue, and peritoneum. In this chapter we purpose considering it in its structural aspect. In its formation the following functions have been provided for. As compared with the floor of the male pelvis, the female pelvic floor differs in having in it the cleft known as the vagina. Then further, women have to undergo parturition in which the child is born through the vagina, which is then greatly distended. At the same time a woman has resting on her pelvic floor the same abdominal viscera as the male, and her pelvic floor is also subjected to the same strain from intra-abdominal pressure. Thus we have to explain how the female pelvic floor has been constructed so as to allow of parturition and the rectal and vesical functions, and yet remain strong enough to resist ordinary intra-abdominal pressure. The question is a *structural* or architectural one. We study it in this present chapter just as we should study the structure of a box or chair.

In order to understand this question, we must study the pelvic floor as seen both in *sagittal mesial* and in *axial coronal section.*

a. Sagittal Mesial Section.

Its appearance in Sagittal Mesial Section.

In this view (*cf.* Pl. II.) we see the pelvic floor or diaphragm stretching from symphysis pubis to sacrum. The anus is to be imagined closed, as in life. The first thing to note is the vagina, which is seen as a cleft running upwards in the pelvic floor from hymen to cervix uteri. Its walls are in close apposition (*vide* figs. *passim*). They are often erroneously represented apart; in order, as it were, to let the student *see* the vagina. This is wrong, however. It is no more necessary to figure the vaginal walls always apart than it would be always to sketch a man with his mouth open to render it visible. The first idea one gets on looking at a frozen section is that, owing to the apposition of the vaginal walls, the pelvic floor is unbroken; and that the vaginal cleft, the introduction of which does weaken the floor somewhat, cuts it not perpendicularly to the horizon but obliquely at an angle of about 60°.

The pelvic floor, as seen in this section, is made up of two segments, which are known as the *pubic* and *sacral* segments. It is of importance to define these exactly.

The Pubic Segment.

The *Pubic Segment* is made up of loose tissue—viz., bladder, urethra, anterior vaginal wall, and bladder-peritoneum. It is attached in front to the symphysis pubis. This attachment is a loose one; the bladder and urethra, meeting one another at right angles, are separated from the pubes by the pyramidal deposit of loose fat already described as the retropubic fat deposit. Note specially that the retropubic fat deposit as seen in this section—that of a subject in the dorsal or the erect posture—is triangular; and that the peritoneum passes from the anterior abdominal wall on to the fundus of the bladder, just a little above the top of the symphysis. Below the pubic arch the urethra becomes blended with the perineal muscles there.

The Sacral Segment.

The *Sacral Segment* is attached to the coccyx and sacrum; it consists of rectum, perineum, posterior vaginal wall, and strong tendinous and muscular tissue. The inferior portion of this segment, the perineum, lies about 1½ inches from the symphysis.

In addition to the retropubic fat deposit, it should be noted that—

a. The posterior wall of the bladder is *loosely* attached to the anterior vaginal wall;

b. The urethra and anterior vaginal wall are *closely* blended;

c. The posterior vaginal wall and anterior rectal wall are *loosely* connected as far down as the apex of the perineal body (fig. 30).

The Segments contrasted.

The two segments, as seen in sagittal mesial section, are thus *anatomically* contrasted:—

The pubic segment is made up of loose tissue, and is loosely attached to the pubic symphysis; the sacral segment is made up of dense tissue, and is firmly dovetailed into the sacrum and coccyx.

They are further contrasted *functionally*:—

The pubic segment is drawn up during labour; the sacral segment is driven down.

The proof of this functional contrast is too elaborate to be given here, but will be found in detail in Hart's Atlas. Briefly stated it is that during labour the pubic and sacral segments as seen in a sagittal mesial section may be likened to two folding doors. Uterine action pulls up the pubic segment, and drives the child down against the sacral one. This action is analogous to the way one passes out through two folding doors, when he pulls the one door towards him and pushes the other from him. As the result of this elevation of the pubic segment, the bladder is drawn in part above the pubes and its peritoneum stripped off (fig. 39).

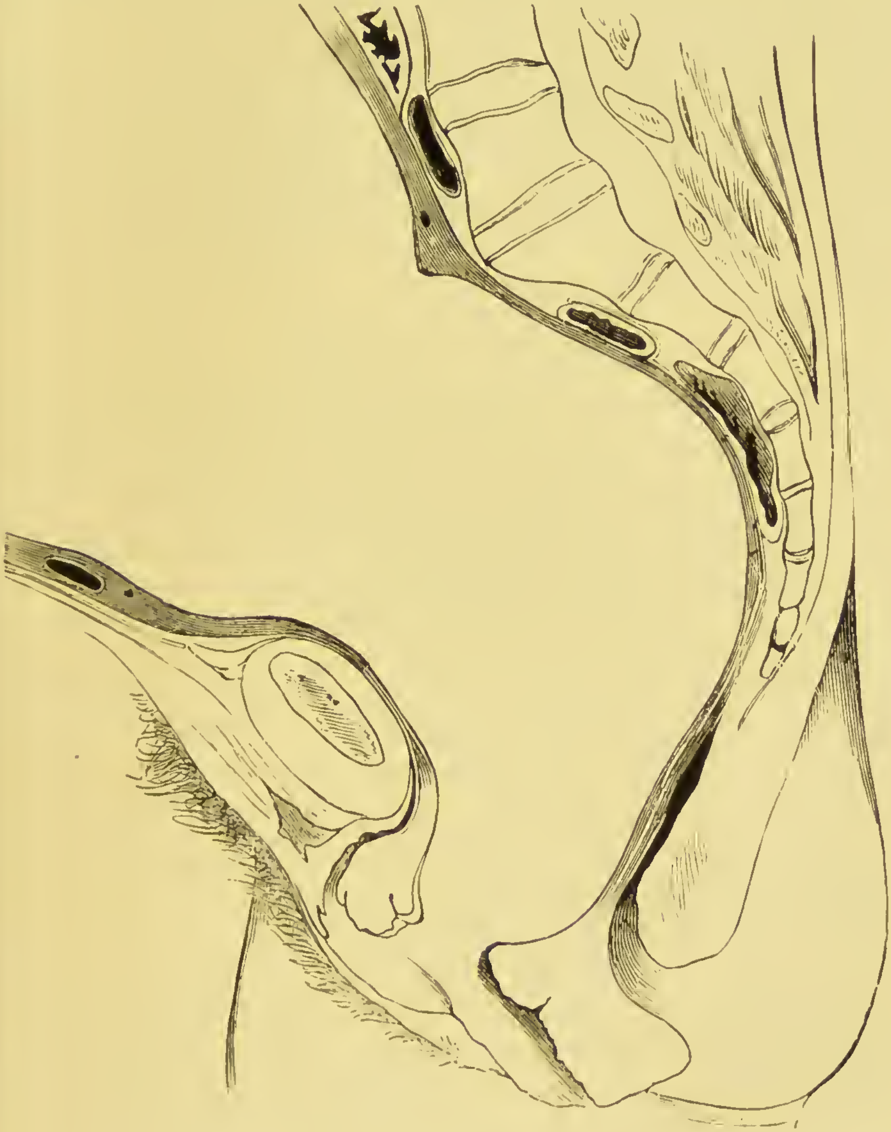

FIG. 39.

PELVIC FLOOR differentiated in parturition (*Braune*). The Pubic Segment is drawn up and the Sacral one driven down. Note position of bladder and its peritoneum.

Displacement of the Pubic Segment.

The various components of the pubic segment are definitely displaced in its movements. Thus the retropubic fat is—

1. Behind the pubes in the non-parturient female (fig. 32);

2. Above it in the parturient female (fig. 39);
3. Below it in prolapsus uteri;
4. Below it in the extra pelvic-floor projection of pregnancy;
5. Partially above the symphysis in the genupectoral posture (fig. 51).

The peritoneum is—

1. Reflected on to the top of the empty bladder in the non-parturient female;
2. Stripped off the bladder during parturition;
3. Reflected on to fundus of empty bladder, at a higher level above symphysis, in the genupectoral posture.

Thus the peritoneum over the bladder is movable; the peritoneum over the sacral segment is fixed.

b. Axial Coronal Section.

Axial Coronal Section.

If now we study axial coronal sections, we shall find these views (based on sagittal mesial) both enlarged and modified. If actual sections be examined it will be found that, owing to the presence of loose tissue, a line of cleavage runs within the obturator internus, upper part of the levator ani, and rectum, separating these structures from the vagina. We thus find a complete ring of loose tissue of which part has been seen in sagittal mesial section and part in axial coronal section. This ring of loose tissue runs as follows:—beginning behind the pubes (retropubic fat), it passes on the internal aspect of the obturator internus and upper portion of Levator ani of the left side; between the posterior vaginal and anterior rectal walls; on the inner aspect of the obturator internus and upper portion of the Levator ani of the right side; and then back to the retropubic fat. This ring of loose tissue divides the pelvic floor into two portions:—

a. The entire displaceable portion;
b. The entire fixed portion.

a. The entire displaceable portion comprises bladder, urethra, and vaginal walls. It has resting upon it the uterus, broad ligaments, Fallopian tubes, and ovaries; and lies within the ring of loose tissue.

b. The entire fixed portion lies outside of the ring of loose tissue. If the entire displaceable portion were cut out of the pelvic floor, then on looking through the pelvic brim we should see, *in front*, the posterior aspect of the pubes, sloping downwards and backwards; *at the sides*, the inner aspects of the obturator internus sloping downwards and inwards; and *behind*, the anterior rectal wall and sacrum sloping downwards and forwards. We should, in fact, be looking down into a funnel whose walls all sloped towards a central point. This funnel forms the entire fixed portion of the pelvic floor.

It will now be understood that the entire fixed portion supports the entire displaceable portion; and that consequently on these two combined (*i.e.*, the whole pelvic floor) the uterus and annexa and the abdominal viscera rest.

Divisions of Pelvic Floor.

The terminology given need not confuse if it be remembered that the terms "pubic segment and sacral segment" apply to sagittal mesial sections only, and are applicable to the mechanism of parturition; while "entire displaceable and entire fixed portions" apply to transverse sections, and are to be used for the general physics of the pelvic floor and for prolapsus uteri. The relation between the two views given by sagittal mesial section and by transverse (or by axial coronal) section may be represented as follows:—

Sagittal Mesial Section.		*Transverse or Axial Coronal Section.*
Pubic Segment.	Bladder and urethra,	Entire displaceable portion.
	Anterior vaginal wall,	
Sacral Segment.	Posterior vaginal wall,	
	Tissue attached to sacrum,	Entire fixed portion.
	Bowel in pelvic floor,	
	All outside of inner aspects of levator ani.	

Functions of Pelvic Floor.

The chief functions demanded of the female pelvic floor are—

a. *Support of Intra-abdominal Pressure,*
b. *Vesical and rectal functions,*
c. *Parturition.*

a. Support of Intra-abdominal Pressure. The abdominal and pelvic viscera rest on the pelvic floor; more correctly, these viscera (along with the entire displaceable portion of the pelvic floor) rest on the entire fixed portion of the pelvic floor, the inward convergence of whose parts enables them to support these. Prolapsus uteri is thus, as we shall afterwards see, not a mere uterine descent, but a downward displacement of the abdominal and pelvic viscera along with the entire displaceable portion of the pelvic floor.

b. Vesical and rectal functions. The loose tissue round the rectum and bladder allows of the contraction and diminution in bulk of these organs which are necessary for the expulsion of their contents.

c. Parturition. This is the great function of the pelvic floor, and is provided for structurally as follows. The child is driven through the vagina (*i.e.* through the entire displaceable portion) by the upward tension of the uterine muscle attached to the top of the vaginal walls and by the dilating pressure of the fœtal head. This upward movement of the entire displaceable segment is allowed by the ring of loose tissue of which we have spoken. We are now able to understand the full significance of the statement already made that the pubic segment of the pelvic floor is pulled up partly into the abdominal cavity while the sacral segment is driven downwards and backwards. In addition, the levatores ani will be pressed outwards.

The result of parturition is, (1) To dilate the vaginal walls and render them more easily everted; (2) to tear the inferior margin of the sacral segment, *i.e.* the perineum; (3) to elongate and slacken the ring of loose tissue uniting the entire displaceable and the entire fixed portions. In this way, it favours that driving downwards and outwards of the entire displaceable portion which happens in Prolapsus uteri.

CHAPTER V.

THE BLOOD-VESSELS, LYMPHATICS, AND NERVES OF THE PELVIS: DEVELOPMENT OF PELVIC ORGANS.

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BLOOD-VESSELS.

Preliminary Remarks.—The blood supply to the pelvic organs and perineum is derived from the ovarian arteries (which are branches of the abdominal aorta), and from the uterine, vaginal, and internal pudic arteries (which are all branches of the anterior division of the internal iliac).

We shall first consider the arterial supply of the uterus, ovary, Fallopian tubes, vagina, bladder, rectum, and that of the perineal region; and then the venous distribution.

ARTERIAL SUPPLY.

Arterial supply to Uterus and Ovary.

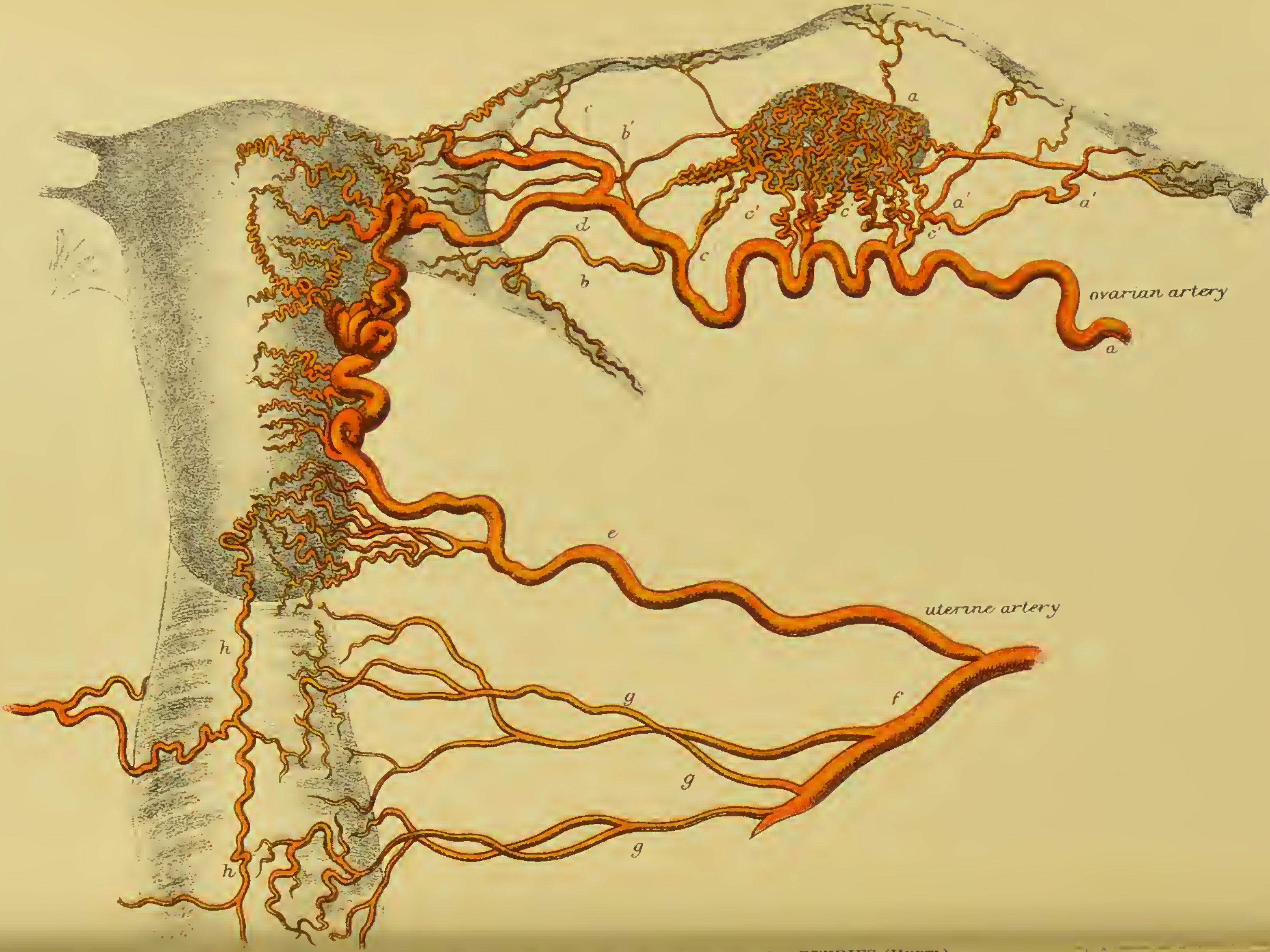
(1.) *Arterial supply to uterus, ovary, etc* —The *Ovarian artery* of each side (corresponding to the spermatic of the male) is a branch of the abdominal aorta. Its course in the abdomen is well seen in Plate I., in which, however, the origin of the artery on the left side is abnormal, springing from an aberrant renal artery instead of from the aorta direct. In the pelvis it passes between the layers of the broad ligament, running tortuously towards the upper angle of the uterus. Near this it divides into two branches. The upper supplies the fundus uteri; the lower anastomoses at the side of the uterus with the uterine artery (Plate III. *c*, *d*).

The Ovarian artery gives off—

Branches to the ampulla of the Fallopian tube (Plate III. *a′ a′*).
Branches to the isthmus (*b′*).
Numerous branches to the ovary (*c′ c′ c′*).
Branch to the round ligament (*b*).

The *Uterine Artery* (Plate III. *e*) springs from the anterior division of the internal iliac, and passes downwards and inwards towards the cervix uteri. It then passes upwards between the layers of the broad ligament by the side of the uterus, in an exceedingly tortuous manner well shown in Plate III., to anastomose with the lower branch of the ovarian. The course of the blood-vessels in the uterine wall has been studied and described by Sir J. Williams with special reference to some anatomical and pathological points. The primary branches after entering the uterine tissue have a somewhat superficial course, being separated from the peritoneum by only a thin layer of muscular fibres. From these, secondary branches run towards the mucous surface in a direction perpendicular to that surface; these anastomose freely and end in capillary loops in the mucous membrane. All internal to the primary branches—the greater part of the muscular wall—belongs, according to Williams, to the mucous membrane, *i.e.*, to the muscularis mucosæ. The *Vaginal arteries* (*g g g*) usually spring immediately from the anterior division of the internal iliac artery, but sometimes arise from the uterine or middle hæmorrhoidal. A special branch of the uterine artery to the cervix joins with its fellow at the isthmus to form the circular artery, and with those of the vagina to form the azygos artery of the vagina (*h h*). The vaginal arteries of one side anastomose freely

PLATE III.



DISTRIBUTION OF OVARIAN, UTERINE, AND VAGINAL ARTERIES (HYRTL).

with those of the other. Plate III., from Hyrtl, illustrates beautifully the free anastomosis of branches of the aorta with the ovarian, uterine, and vaginal arteries. It should be noted that, in operation for removal of the uterus, ligature of the broad ligament controls all hæmorrhage.

From the same anterior division of the internal iliac proceeds the blood supply to the bladder and rectum.

Arterial supply of Perineum.

Arterial supply to the perineal region.—This comes from the internal pudic. The superficial perineal branch supplies the labia; the artery to the bulb supplies the bulbus vaginæ; the terminal branches go to the clitoris.

VENOUS SUPPLY.

Veins of of Pelvis.

The venous supply of the pelvis is very abundant, and exists in the form of numerous plexuses freely communicating with one another. The veins are unprovided with valves; hæmorrhage from a wound is therefore often exceedingly profuse, especially during pregnancy, when the whole pelvic vascular system is hypertrophied.

The following is a summary of the main facts as to the venous supply of the female pelvis.

The *Vesical plexus* lies external to the muscular coat of the bladder. The *Hæmorrhoidal plexus* lies below the mucous membrane of the lower part of the rectum.

The veins of the *labia* correspond in distribution to the arteries, and those from the outermost parts drain into the pudic which opens into the common iliac vein. Large veins from the labia minora open into the pars intermedia of the bulb.

The veins from the *glans* and *corpus clitoridis* pass into the dorsal vein of the clitoris, which communicates with the vesical plexus.

The veins of the *bulb* pass into the vaginal plexus.

The *Vaginal plexuses*—one outside the muscular coat and one in the submucous tissue—are most abundant at the lower part of the vagina, communicate with the hæmorrhoidal and vesical plexuses, and open into the internal iliac vein.

The *Uterine plexus* is very abundant, as is well shown in one of Hyrtl's plates; it ultimately opens into the ovarian veins (fig. 40), which pass on the right side to the inferior vena cava, on the left to the left renal vein. The right ovarian vein has a valve where it pierces the coat of the inferior vena cava (*Brinton*, quoted by Lawson Tait). The veins are small, lie in the outer muscular coat, and run longitudinally; in the middle layer of that coat they open into large sinuses (surrounded by circular unstriped muscle) with which the capillary vessels communicate. This is an arrangement like that in the corpus spongiosum of the penis (*Klein*).

The *Ovarian plexus*, otherwise known as the pampiniform plexus, lies between the folds of the broad ligament and communicates with the uterine plexus (fig. 40). Some apply this term to all the veins in the broad ligament. The ovarian plexus open into the inferior vena cava.

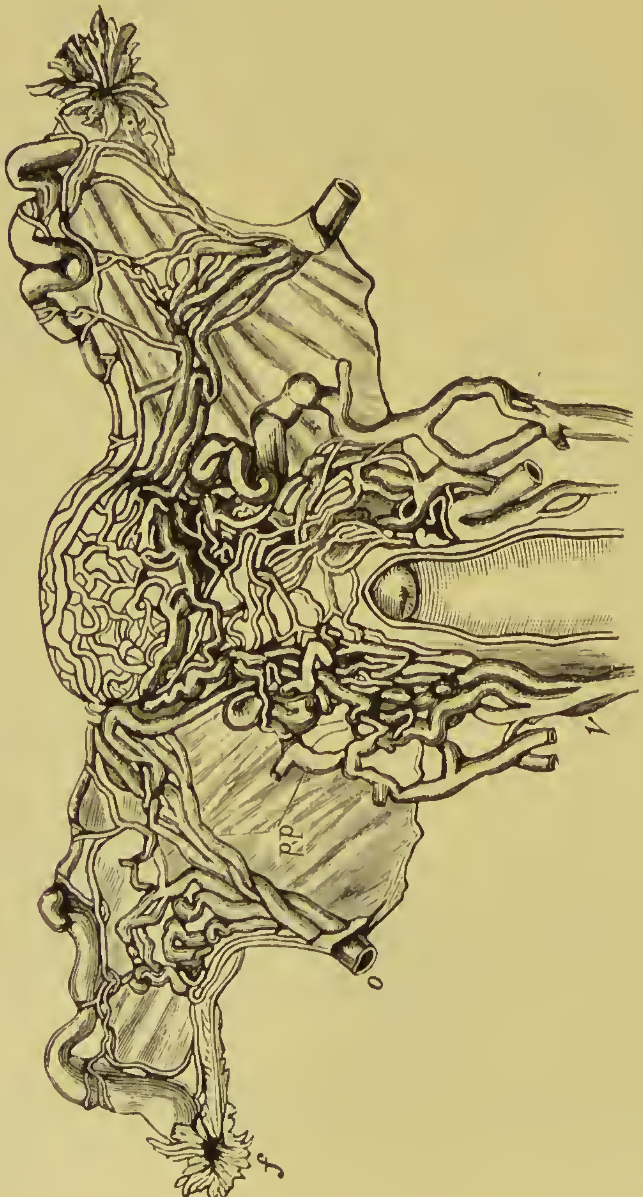


FIG. 40.

UTERUS and VAGINA with their venous supply, seen from behind—(*Luschka*). *f* Fallopian tube; *pp* pampiniform; *o* ovarian; *v* vaginal plexuses.

Just at the hilum of the ovary lies the collection of veins known as the bulb of the ovary.

Beneath the peritoneum and between the layers of the broad ligaments are vast venous plexuses. Knowledge on this point is of the highest importance in relation to pelvic hæmatocele.

The vesical, hæmorrhoidal, and vaginal plexuses, with the pudic veins open into the internal iliac vein which joins the inferior vena cava.

From the hæmorrhoidal plexus, the superior hæmorrhoidal vein passes into the portal system; and thus we get a communication between the pelvic and portal venous systems.

In the vaginal mucous membrane, clitoris and uterus, we have erectile tissue, *i.e.*, veins in connective tissue with unstriped muscular fibre.

LYMPHATICS.

Lymphatic Glands.

Under this we take up—

a. The Lymphatic Glands;
b. The Lymphatic Vessels.

a. The Lymphatic Glands.—These are (1) the *inguinal glands*, which lie parallel to and just below Poupart's ligament; and (2) the *pelvic glands*. These latter consist of the following:—

(*a*) A gland at the isthmus uteri (*Championnière*);
(*b*) Hypogastric or iliac glands, which lie subperitoneally in the space between the external and internal iliac vessels;
(*c*) Sacral, on the lateral aspect of the anterior surface of the sacrum and in the mesorectum; and
(*d*) A gland or collection of small glands at the obturator foramen —the obturator gland of Guérin.

These all pour into the lumbar glands, which lie in front of the lumbar vertebræ and discharge into the thoracic duct.

Lymphatic Vessels of External Genitals.

b. The Lymphatic Vessels. (1.) *Of External Genitals.*—Numerous vessels form a network on the internal aspect of the labia majora, over the labia minora, and round the vaginal and urethral orifices, vestibule, and clitoris; all of these open into the inguinal glands. From this arrangement, the enlargement of the inguinal glands in syphilis and vulvar cancer is intelligible. The lymphatics of the *lower fourth of the vagina* also open into these glands.

Of Vagina.

(2.) *Of Vagina* (*upper three-fourths*) *and Cervix Uteri.*—These lymphatics open into the hypogastric glands.

So far we have followed Sappey's description. Le Bec, however, asserts that the lymphatics of the vagina pour into a series of trunks at the level of the isthmus uteri, and that those of the cervix join them; and that the conjoined lymphatics then pass below the base of the broad ligament to the obturator gland, from which vessels communicate with others from the thigh and even from the epigastrium.

The relation between lymphatics and glands is as follows:—

(*a*) Those of the external genitals pass into the inguinal glands;

(*b*) The lymphatics of the bladder, vagina, and cervix pass to the hypogastric glands (*Sappey*). According to Le Bec, they pass to the obturator gland.

Of Uterus. (3) *Of Uterus.*—The lymphatics of the body of the uterus pass through the broad ligaments; and, along with those from the ovary and Fallopian tube, enter the lumbar glands. If Le Bec be right, the lymphatics from the cervix pass *below* the broad ligament and those from the uterus along the *upper* part of the same. Some of the uterine lymphatics pass along the round ligament to the groin.

Leopold, who has investigated the lymphatics in the unimpregnated uterus considers "the mucous membrane of the uterus as a lymphatic surface which contains no special lymphatic vessels, but consists of lymph sinuses covered with endothelium.

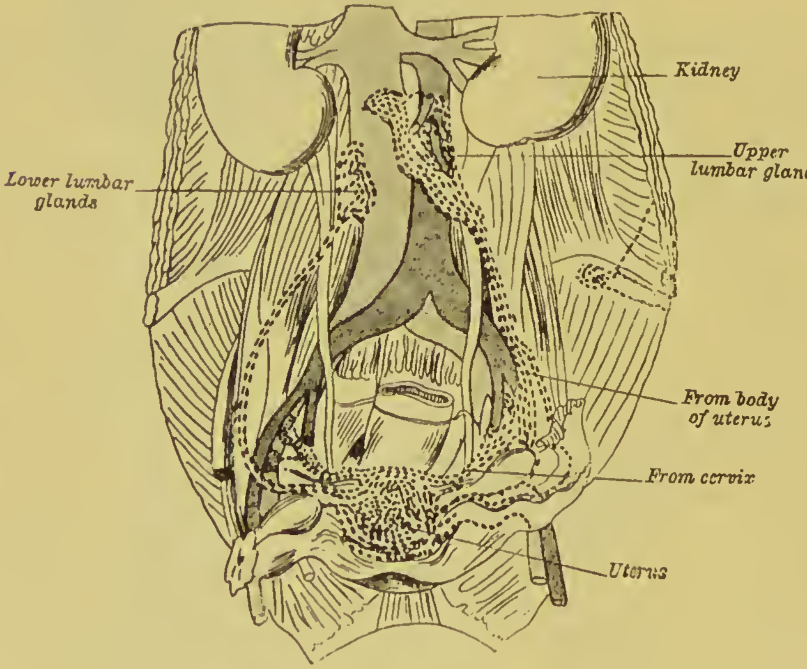


FIG. 41.
LYMPHATICS and LYMPHATIC GLANDS of PELVIS and lower part of ABDOMEN (*Poirier*).

"The lymph passes from the lymphatic spaces of the mucous membrane, through the mucous membrane hollows, into the lymph spaces and vessels of the muscular coat, surrounds here all the bundles up to the serous covering, and flows into the larger vessels which enter the broad ligament in the neighbourhood of the blood-vessels" (*loc. cit.*, p. 31).

These are matters not of mere anatomical detail, but of the very highest pathological and practical importance. The richness of blood and lymphatic supply to the vagina, cervix, and uterus explains the extraordinary rapidity with which septic matter spreads through the body, and the extreme danger which may attend even an insignificant lesion of the internal genital organs, when septic matter is present and is absorbed. We may remark here that septic matter will of course follow the lymphatic routes already laid down, and that bacteria can penetrate the walls of blood-vessels and pass into the general circulation. It should not be forgotten, however, that the bacteria passing along the lymphatic vessels may penetrate them, pass into the peritoneal cavity, and thence spread through the diaphragm to set up the pleurisy and pericarditis so common in septicæmia (*Lusk*). Thorough comprehension of lymphatic distribution and knowledge of the evil effects of septic matter are of the first importance to the student.

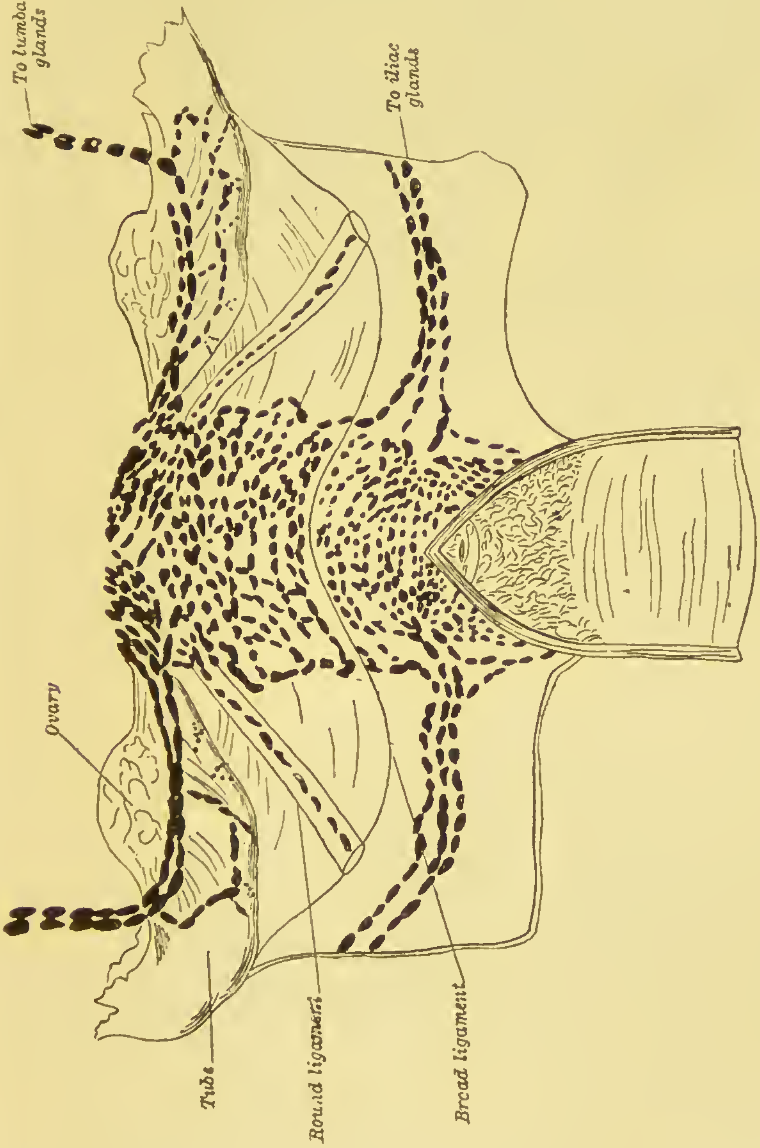


Fig. 42.
Lymphatics of Uterus (*Poirier*).

Relation between Glands and Lymphatics.

The lymphatics of the *Rectum* lie in two layers (mucous and muscular), and open into the glands of the mesorectum or into the sacral glands.

The stomata of the peritoneum of the pelvis communicate with lymph capillaries lying in the subendothelial tissue.

The *Inguinal Glands* (parallel to Poupart's ligament) receive the lymphatics of the vulva, lower $\frac{1}{4}$th of vagina, and urethra.

The *Hypogastric or Internal Iliac* receive those of the bladder, upper $\frac{3}{4}$ths of vagina, and neck of uterus.

The *Sacral Glands* receive those from the rectum.

The *Lumbar Glands* receive the lymphatics from the pelvic glands, body of the uterus, Fallopian tubes, and ovaries (*v.* figs 41 and 42).

NERVES.

Pelvic Nerves.

These are (*a*) Spinal; (*b*) Sympathetic.

(*a*) *Spinal.* The pelvic muscles are supplied as follows: *Levator and Sphincter ani* by inferior hæmorrhoidal branch of pudic, 4th and 5th sacral, and coccygeal nerves; *Coccygeus*, by 4th and 5th sacral and coccygeal nerves; *Muscles of Perineum and Clitoris*, by the branches of pudic nerve.

(*b*) *Sympathetic.* The hypogastric plexus lies between the common iliac arteries; it gives off branches which, reinforced by branches from the lumbar and sacral ganglia and sacral nerves, form the *inferior hypogastric plexuses*—one on each side of the vagina. From these, filaments proceed to the vagina, uterus, Fallopian tube, and ovary.

Frankenhäuser describes a ganglion at the cervix uteri and also a vesical one. Jastrebow found the cervical ganglion to be a plexus with a ganglion enclosed in it.

The pelvic, splanchnic, and the hypogastric nerves are motor and sensory to the bladder. The pudic is motor to the sphincter ani and all the striped muscles of the vagina and clitoris: it is sensory to the skin of the perineum (*Griffiths*).

The terminations of the nerves in the muscular layers of the uterus have been studied by Frankenhäuser, who figures them passing to the nuclei of the unstriped muscle. Those entering the mucous membrane are said to end in ganglia. Numerous end bulbs have been found in the clitoris and vagina.

Gawronsky has found that in the vagina the nerves end in the epithelium, and in the uterus in the glands and epithelium. In the tube there are two concentric plexuses ending in the epithelium and in the nerve cells of the submucosa; while in the ovary they pass to the Graafian follicles and to the cells of the membrana granulosa.

DEVELOPMENT OF THE PELVIC ORGANS.

This is best considered for our practical purposes in the fœtus at the sixth and eighth weeks, and between the third and fourth months.

At the sixth and eighth weeks we have the following structures developed, viz., the ducts of Müller, the Wolffian bodies and duct, and the Ovary.

Fig. 43, from Keibel, shows a drawing of a model of the organs late in the second month, and shows very well the relation of the organs in sagittal mesial section. The length of the urino-genital sinus should be noted. At its upper end is to be seen the eminence of Müller, the projection where the ducts of Müller end, and below the level of which the Wolffian ducts open into the sinus.

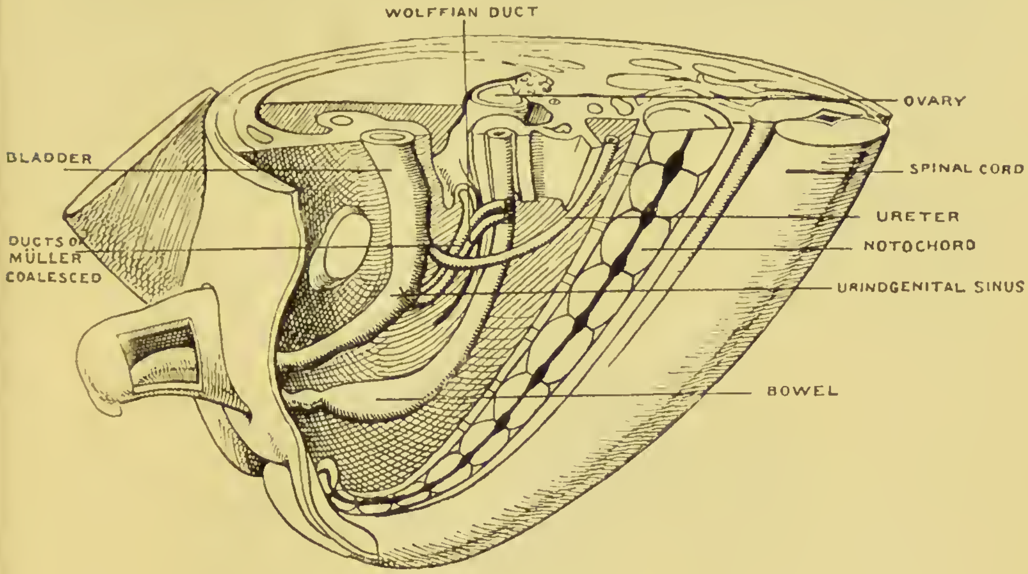


FIG. 43.

MODEL OF ORGANS AT END OF SECOND MONTH (*Keibel*). The × indicates the top of the urino-genital sinus, and Müller's eminence where the hymen develops.

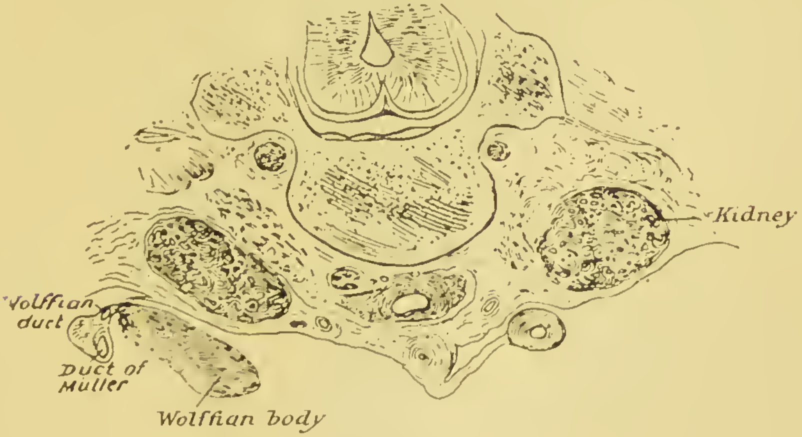


FIG. 44.

Shows outer ridge where Ovary and Duct of Müller develop.

The origin of the Wolffian duct is disputed, some alleging that it arises from the Mesoderm. We believe in its origin from the Ectoderm, as has been shown by several investigators.

To see further details we must study transverse sections of a six weeks' fœtus cut serially by the paraffin method.

In fig. 44 a ridge is seen developed to the outer side of the Wolffian body; it is in

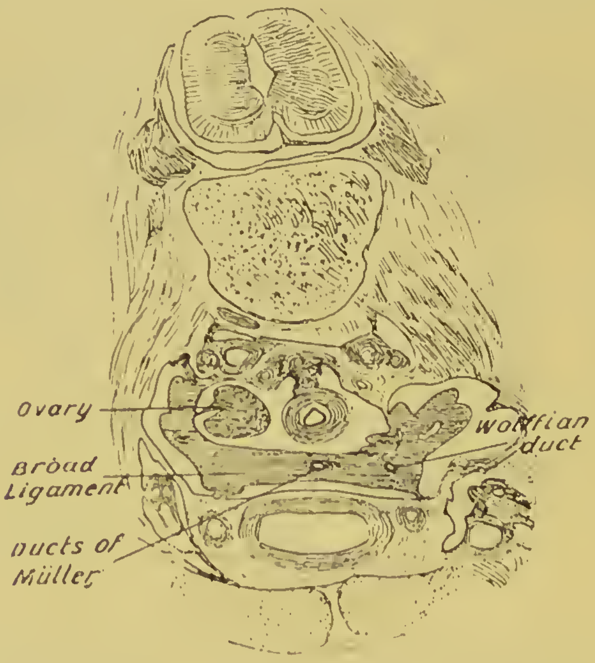


FIG. 45.
T.S. showing Ovary and Broad Ligaments.

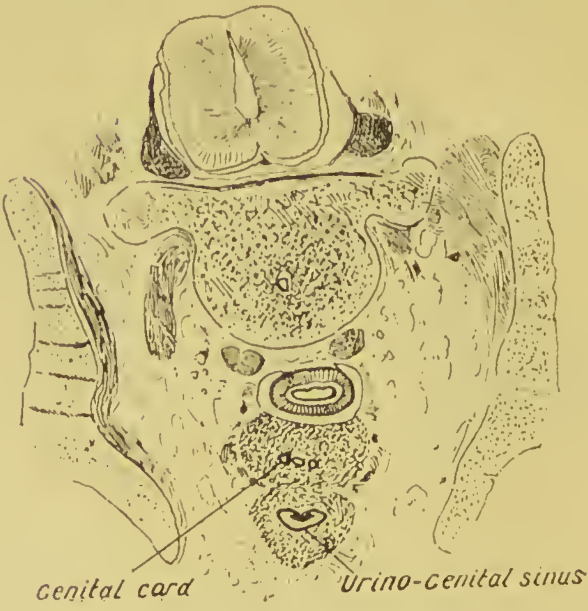


Fig. 46.
T.S. showing Genital Cord.

connection with this ridge that the duct of Müller and the ovary arise. This ridge has two portions, an outer and inner. The outer has the ducts (Wolffian and Müllerian) in it, and curves in front of the inner to form the broad ligaments. The inner soon assumes the characteristic shape of the ovary. At first the union between the ridges is quite thin (fig. 44).

The section below this now shows us the broad ligament fully formed with the two ducts of Müller near its centre, the Wolffian duct on each side, and the ovary attached to its posterior surface, while at the hilum of the ovary we see the remains of the Wolffian tubules (fig. 45).

The outer surface of the ovary is covered with columnar epithelium, the germ epithelium of Waldeyer. This passes into the substance of the ovary, and gives rise to the ova and membrana granulosa.

At the level of the pelvic cavity, in the pelvic floor in fact, we come on the genital cord of Thiersch, containing three canals, the two outer being the Wolffian ducts, the central one the coalesced Müllerian ducts (fig. 46). In an earlier fœtus (fourth to fifth week) the ducts of Müller have not blended, and we thus get four canals on section.

In the figs. 46 and 47 we see the urino-genital fissure as a crescentic section with the eminence of Müller on the back wall in fig. 46. Here the ducts of Müller end blindly. Section 47 shows the Wolffian ducts opening into the urino-genital sinus.

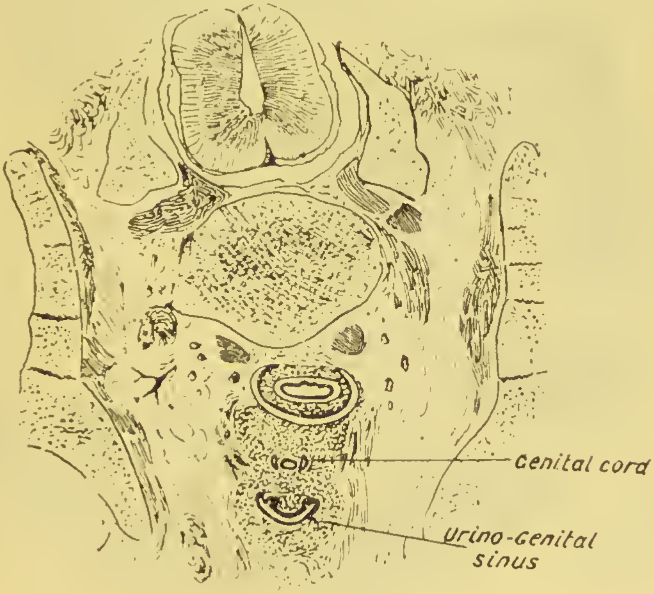


FIG. 47.
T.S. showing Urino-Genital Sinus.

This account gives only the development of the genital tract as far down as the hymen, external genitals, and anus, and does not include an account of the origin of the last three structures.

The Fallopian tubes are the non-coalesced portions of the ducts of Müller; the uterus proper is formed by the union of the ducts of Müller to form one organ, while the remainder of the Müllerian ducts makes up the vagina down to, but not including, the hymen.

We have now therefore to consider the development of the hymen, but defer that of the external genitals and of the anus till afterwards (*v.* Sect. on Vulva).

DEVELOPMENT OF THE HYMEN.

To study the development of the hymen one must examine serial sagittal mesial and lateral sections of a female fœtal pelvis between the third and fourth months. It will then be found that two epithelial bulbs form at the site of the hymen, that they are at first solid and have a structure the same as the epithelium of the fully developed vagina. The cells at the periphery of the bulb are the same as those in the deep layers of the vaginal epithelium. According to some these bulbs arise from the ducts of Müller, but the Wolffian ducts have been traced into them, and they therefore appear to arise from the Wolffian ducts and are thus Ectodermic. Whatever be their origin they perform a very remarkable part in development. Their epithelium passes into the Müllerian vagina and, filling it up, renders it at first solid. The central cells of the bulbs and of the now solid vagina are, however, derived from the superficial cells, and more liable to break down, and thus a lumen forms again. The urino-genital sinus on the outer surface opposite these bulbs now sends in processes, and in this way the hymeneal opening is formed (fig. 48).

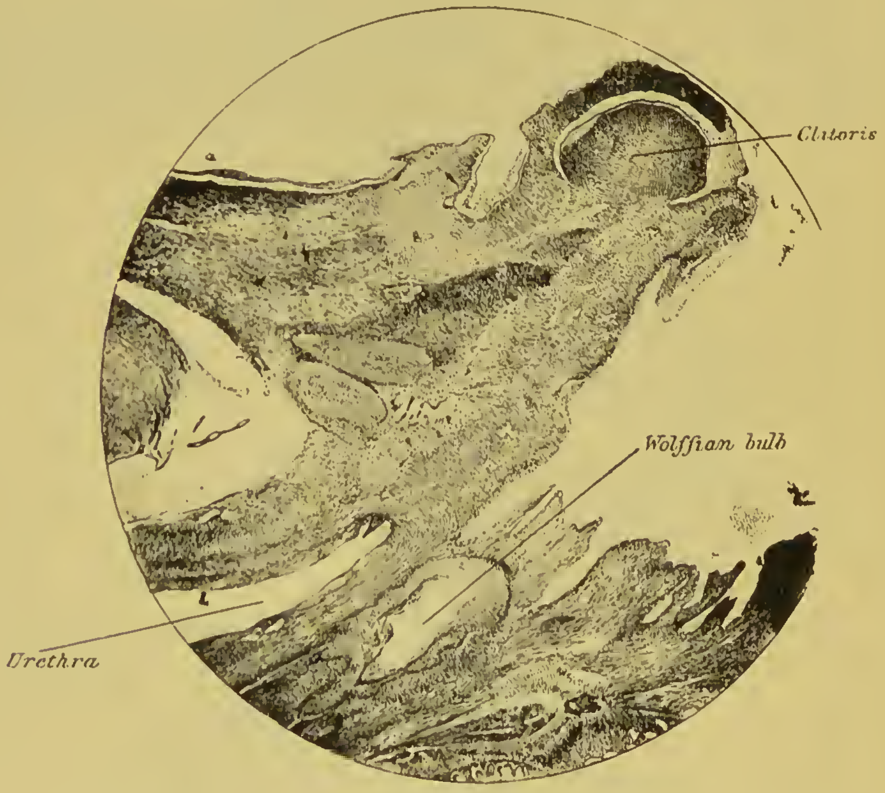


Fig. 48.

Shows the Wolffian bulbs formed and breaking down in the centre. The involution from the urino-genital sinus is also seen. Above, the involution of the Epidermis to form the prepuce of the Clitoris can also be noted.

The epithelial cells of these bulbs not only pass into the vagina but map out the fornices and pass at first into the lower part of the cervical canal.

The genital tract, therefore, arises from the ducts of Müller in its upper two-thirds, the urino-genital sinus in its lower third, while the hymen is developed from the Wolffian ducts.

This view explains the skin-like structure of the vagina and vaginal portion of the cervix, and the different structure of the genital tract above the os externum.

It has been for some time discussed whether the hymen is to be considered vulvar or vaginal. The real fact of the matter seems to be that it is Wolffian and vaginal.

Further details in development will be considered under the special organs.

CHAPTER VI.

PHYSICS OF THE ABDOMEN AND PELVIS, WITH SPECIAL REFERENCE TO THE SEMIPRONE, GENUPECTORAL AND TRENDELENBURG POSTURES.

LITERATURE.

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In this chapter it is proposed to give a brief sketch of a subject of the highest importance but still in its infancy. The *résumé* must be restricted, from want of space, to certain practical points of which we consider here the following:—

1. *The effect of intra-abdominal pressure on the female pelvic floor;*
2. *The results brought about by change of posture, especially by the genupectoral and Trendelenburg postures.*

THE EFFECT OF INTRA-ABDOMINAL PRESSURE ON THE FEMALE PELVIC FLOOR.

Effect of intra-abdominal pressure.

We suppose the body to be in the upright posture. For simplicity, the pelvic floor is considered as being under fluid pressure. Fig. 49 shows the effect of this on the pelvic-floor segments. Fluid pressure acts at right angles to the limiting surface, which in this case is the pelvic peritoneum. Thus, if the perpendiculars be counted, starting from the symphysis, it can readily be seen that the first three will press the pubic segment against the symphysis; that the fourth and fifth will do this also, but will further have a resultant tending to drive the pubic past the sacral segment; that the sixth and seventh will, directly, tend to do this last; and that the others will drive it partly past the sacral segment, and partly against it. From want of rigidity in the pubic segment, this driving-down tendency is partly lost. Thus the effect of ordinary intra-abdominal pressure is to press the pubic against the sacral segment. Increased intra-abdominal pressure displaces downwards a definite portion of the pelvic floor, viz., all lying in front of the anterior rectal wall.

There is in the pelvic floor a definite line of cleavage at which it yields, which line runs between the anterior rectal and posterior vaginal walls (*see* p. 60). This definite downward displacement causes the lesion known as prolapsus uteri.

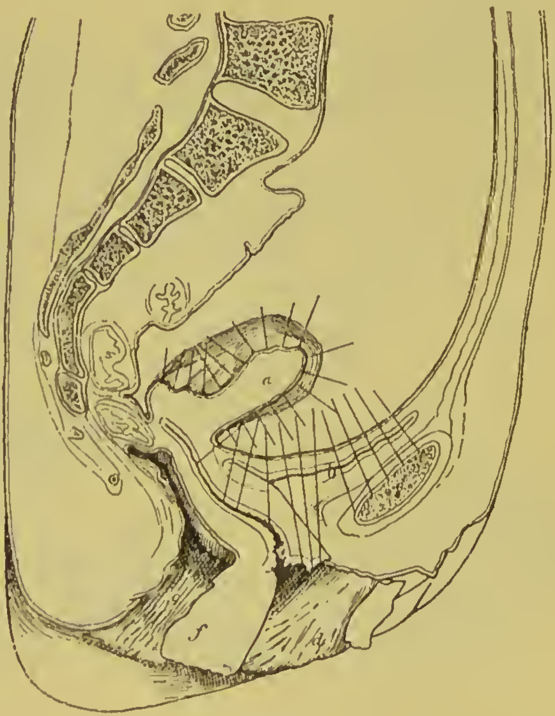

FIG. 49.

DIAGRAM to illustrate effect of intra-abdominal pressure on the segments of the pelvic floor (*Hart*).

a Uterus; *b* Bladder; *c* Retropubic fat; *d* Labium majus; *e* Symphysis; *f* Perineal body; *g* Rectum.

From this we see that the female pelvic floor is not equally strong throughout. It would be, were the sacral segment prolonged and attached to the symphysis pubis. But then parturition would be an impossibility. It has been constructed not only *quâ* intra-abdominal pressure, but also *quâ* parturition and the vesical and rectal functions.

THE RESULTS BROUGHT ABOUT BY CHANGE OF POSTURE, ESPECIALLY BY THE GENUPECTORAL POSTURE.

Effect of change of Posture.

The abdominal walls, along with the viscera bounded by them, are often spoken of as the abdominal cavity with its contained viscera. We must, however, keep in mind that this cavity is always perfectly full. There is never any vacuum in it. The viscera are always in apposition, with only a little fluid as a film separating them. The abdominal walls are yielding, and any tendency to a vacuum is counteracted by atmospheric pressure on the walls. In no posture, is there ever a vacuum in the abdominal cavity. Even if the trunk were inverted, the small intestines would still touch the uterus. The abdominal walls and viscera enclosed by them behave, therefore, like a plastic viscous fluid—like so much thick gum or treacle.

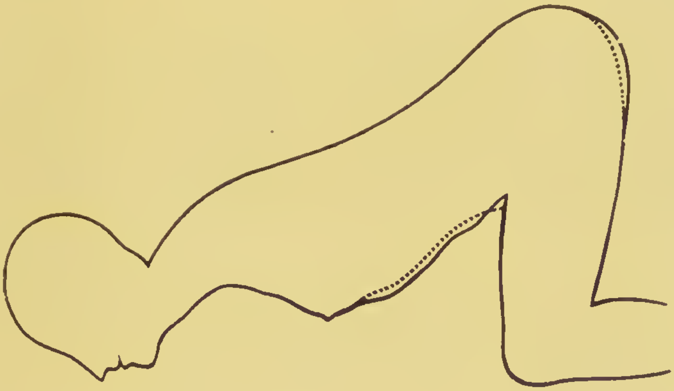

FIG. 50.

OUTLINE OF FEMALE FIGURE IN GENUPECTORAL POSTURE. The dotted line indicates the contour when the vaginal orifice is unopened; the continuous line, the change in contour after air is admitted into the vagina (*Simpson and Hart*).

In the *upright posture*, the viscera bulge above the symphysis pubis, more or less, according to the development of the subject. The bulging is slight in a well-formed female, but excessive if the woman is fat. Just below the sternum, the antero-posterior diameter of the abdomen is lessened. The pelvic floor is convex as seen from without, *i.e.*, the pelvic-floor projection is well marked. Atmospheric pressure is acting equally all over the abdominal and pelvic surfaces; but the pelvic-floor, bearing the weight of the viscera probably bulges more than the other boundaries of the abdomen. A fluid contained in a bag suspended from a fixed point is pyriform, with the bulb nearer the earth. This shape is due to the weight of the fluid.

If a woman be made to assume the *posture* known as the *genupectoral* (better *genufacial*), the bulge is at the sternum. The following points should be noted in regard to this posture (fig. 50):—

1. The antero-posterior diameter of the abdominal cavity is increased at the sternum;
2. It is diminished above the pubes and in the iliac fossæ;
3. The pelvic-floor projection is diminished;
4. The pubic and sacral segments are still in contact, and the abdominal viscera always in contact with the uterus and one another.

Let us now contrast these postures.

Upright and Genupectoral Postures contrasted.

Upright posture	*Genupectoral posture* (fig. 50).
1. Greatest antero-posterior (*a-p*) diameter of abdomen in hypogastrium.	1. Greatest antero-posterior diameter at sternum.
2. Least *a-p* diameter at sternum.	2. Least *a-p* diameter in hypogastrium.
3. Pelvic-floor projection at its maximum.	3. Pelvic-floor projection diminished.
4. Pelvic-floor segments in contact.	4. Pelvic-floor segments in contact.

In the latter posture, on inspection of the genitals, the labia can be seen to be furrowed and the skin over the ischiorectal fossa slightly hollowed. If now the labia majora and minora be separated and the fourchette lifted up, no further change as yet takes place; but when the hymen is opened up, air passes into the vagina (often with a distinct hiss), and the vaginal walls become separated, enclosing a somewhat large cavity. The bulge at the sternum is now slightly increased, while the diameter in the hypogastrium is diminished (*see* fig. 50). *It is only when the anatomical entrance of the vagina (the hymeneal orifice) is opened up that the vagina distends with air.*

It has been shown by A. R. Simpson and D. Berry Hart, that the segments of the pelvic floor separate from each other when a women assumes the genupectoral posture and the hymenal orifice is opened. The pubic segment passes down with the viscera; the sacral segment remains behind, recoiling slightly upwards. *Thus, functionally, the pubic segment is visceral, the sacral one is vertebral.*

They have shown further that there is a definite displacement of the pubic segment constituents, viz.:—

a. The empty bladder is partly above the pubes;

b. The peritoneum passes from abdominal wall to bladder, at a point 1½ inches above the symphysis;

c. The retropubic fat is partly above and partly below the top of the symphysis. We may now once more contrast these postures.

Result of distention of Vagina with Air.

Upright posture.	*Genupectoral posture* (vagina distended with air) (fig. 51).
1 Pubic and sacral segments in apposition and vagina a slit.	1. Pubic and sacral segments separated and vaginal walls bounding a cavity.
2. Retropubic fat behind pubes.	2. Retropubic fat partly above pubes.
3. Empty bladder behind pubes.	3. Empty bladder partly above pubes.
4. Peritoneum passes from anterior abdominal wall to fundus of empty bladder, immediately above symphysis.	4. Peritoneum passes from anterior abdominal wall to fundus of empty bladder, 1½ inches above symphysis.
5. Urethra and bladder meet at a right angle.	5. Urethra and bladder almost in same line.

The reason why the pubic segment passes downwards when the vaginal orifice is opened is, that atmospheric pressure now acts on the vaginal aspect of the pubic segment (with its movable attachment to the pubes) and drives it further down. As the result of this posture, changes take place in the length and direction of the vaginal walls and in the position of the uterus.

1. *Vagina.*—(*a.*) Both walls elongate.
   (*b.*) The anterior follows the direction of the posterior aspect of the symphysis; the posterior, the curve of the sacrum.
2. *Uterus.*—(*a.*) The normally placed uterus passes nearer the sacrum and nearer the thoracic diaphragm.
   (*b.*) The retroverted uterus, fixed or unfixed, becomes more retroverted.
   (*c.*) The retroverted unfixed uterus does not become replaced so as to lie anteverted.

The results given have been obtained as follows:—

a. By observation on living patients, aided by silhouettes of the outlines of the nude body in the upright and genupectoral postures;

b. By study of frozen sections of the female pelvis, and especially by study of a frozen section of a cadaver placed in the genupectoral posture.

For further details on this subject Simpson and Hart's Atlas may be consulted.

An important practical result follows from these observations. *The vagina dilates, or, more properly, the segments of the pelvic floor separate exposing their free margins—the vaginal walls—when a patient assumes the genupectoral posture and the hymeneal orifice is opened so as to admit* *air.* If a patient be so placed opposite a good light, and the sacral segment be drawn up, a complete view of the vaginal walls and cervix is obtained. The same results can be got by placing the patient in the posture known as the *semiprone.* On this last fact is based the use of the vaginal speculum known as Sims' or duckbill speculum (*v.* Chap. X).

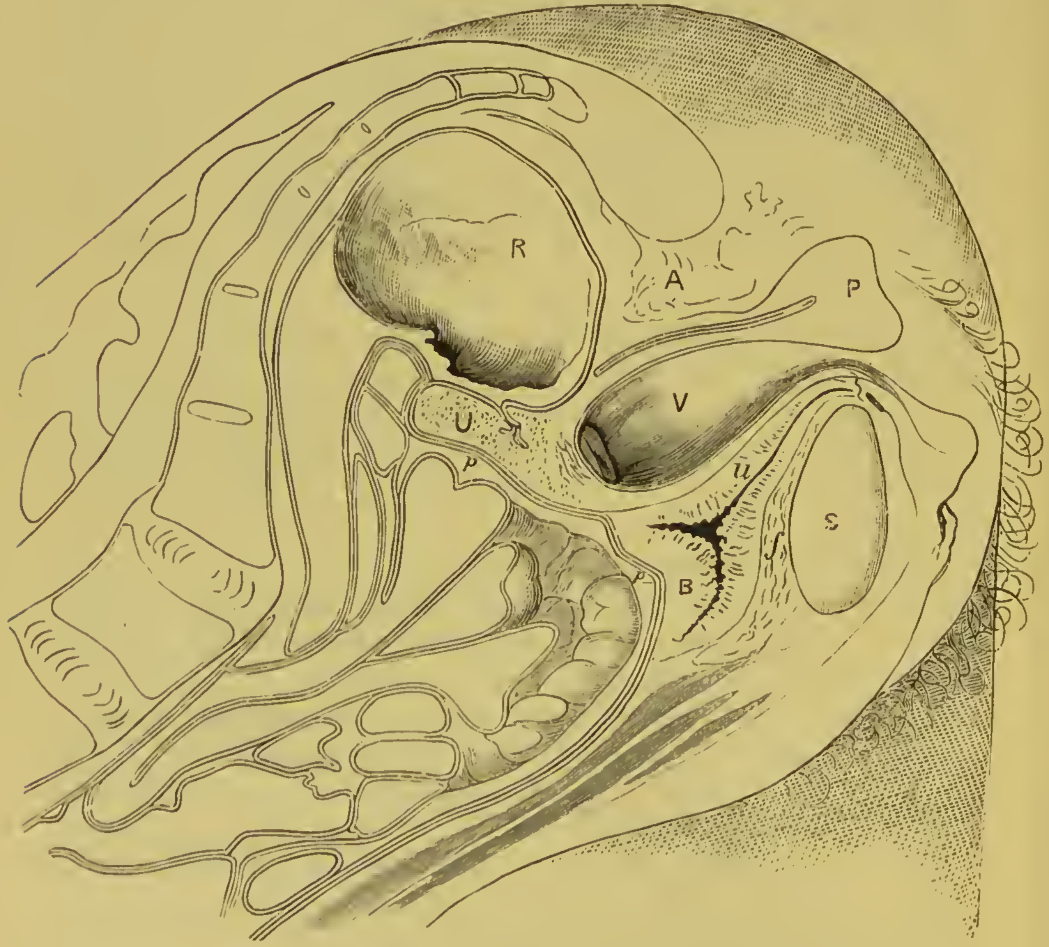

Fig. 51.

Pelvis from Frozen Section of Cadaver in Genupectoral Posture. *A* anus; *P* perineum; *R* rectum; *V* vagina; *u* urethra; *B* bladder; *f* retropubic fat; *U* retroverted uterus; *pp* peritoneum. Between the small intestine and peritoneum is fatty omentum. (*Simpson and Hart.*)

In the genupectoral posture the rectum can be distended if the anus be dilated so as to admit air. The same holds good in the case of the bladder when a urethral speculum has been passed, as Kelly has shown.

This may be put as follows. Owing to the loose attachment of the bladder to the pubes, the vagina, rectum or bladder can be distended with air in the genupectoral posture, the special dilatation depending on whether the anus, vaginal entrance, or urethra is opened up.

TRENDELENBURG POSTURE.

This is a posture of the patient, where, on an appropriate table, the pelvis is elevated and the head lowered so that the body slopes from above down. It may be raised so as to make an angle of 45°, but 18° to 30° is usually enough. The result of this posture is that, when the abdomen is opened, the small intestines gravitate towards the diaphragm, and thus the coils leave the pelvis, leaving the uterus and appendages uncovered. In this way many operations are greatly facilitated, *e.g.*, those on the ovaries and tubes, and on the uterus especially in fibroids and malignant disease.

Further reference will be made to this posture in the chapter on Abdominal Section.

CHAPTER VII.

MENSTRUATION AND OVULATION.

LITERATURE.

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THE subject of Menstruation is not as yet well known, and on many points eminent and trustworthy observers are at variance. The nature of the process is at present *sub lite.* The old theories of its being due to plethora or its being a disease are now exploded, but Heape believes that there is evidence in the monkey (Semnopithecus Entellus) that an irritant is present at a certain stage in the congested blood-vessels below the surface epithelium. The modern view, termed the ovulation theory, asserts that the starting-point in menstruation is the bursting of a Graafian follicle. But in cases of abdominal section performed between the menstrual periods, as has been specially observed by Tait and Leopold, Graafian follicles have been found on the point of bursting, showing that ovulation may in certain cases occur remote from menstruation. An objection that may be urged to this is that abdominal-section cases are not normal. It is of interest to note that Heape, in examining the uteri of menstruating monkeys, found in forty-five specimens only two with a recent corpus luteum.

The observations by Leopold and Mironoff have tended, however, to show that ovulation in the human female may be considered as often preceding and initiating menstruation.

Jacobi, Stephenson, and Reinl (working on Goodman's cyclical theory) have given good proof that a woman in her full sexual vigour seems to pass through a series of cyclical changes, of each of which the menstrual period is the climax. Jacobi found that, during the few days before the flow, the excretion of urea is increased; the temperature is slightly raised; and that, in regard to the pulse, there is a rhythmic wave beginning at a minimum point 1 to 4 days after the cessation of the flow and gradually rising to a maximum 7 or 8 days before menstruation. So far as our present knowledge goes, the following is a brief *résumé.*

PRELIMINARY CONSIDERATIONS.

Preliminaries.

Definition.—A cyclical change with constitutional disturbances whose most marked local phenomenon is a periodical flow of blood from the uterine cavity, with shedding of the superficial layers of its mucous membrane, accompanying (according to the hitherto accepted theory) the discharge of an ovum from the ovary, occurring in properly developed women between the ages of 14 and 44, and interrupted by utero-gestation and lactation.

Period of its Onset.—Menstruation begins, in this country, usually at the age of 13 to 15 (puberty). It may be delayed till 16, 17, or 20; but this is unusual. Its onset is said to be earlier in warm countries, later in cold ones; earlier in delicately nurtured girls. Observations of medical women in India, mainly those of Dr Pechey-Phipson, have shown, however, that early onset is not the rule there, puberty occurring at the same period as in temperate climates.

Period of its Cessation.—With the interruptions of pregnancy and lactation, it continues in healthy women until the age of 44 to 50. The period of its final cessation is known as the menopause. As a general rule the menopause is early when menstruation has begun early, and *vice versa.*

GENERAL PHENOMENA OF MENSTRUATION.

General Phenomena.

Changes at Puberty.—At this period of life, when the girl becomes the woman, we find certain well marked general changes occurring. The bust and mons veneris develop and the whole contour of the body becomes more rounded and attractive; hair appears on the genitals. The romping carriage of the girl becomes subdued, and greater shyness characterises her conduct to the opposite sex.

Phenomena premonitory to each menstrual flow.—There is usually a feeling of weight in the pelvis and increase of sexual inclination. Many women, however, have very little uneasiness during the whole flow; while others are always considerably distressed,—this distress being still outside the boundary of actual disease.

Periodicity and duration of Discharge.—When once established it recurs, in the large majority of cases (about 87 p. c. of the whole), with great regularity: the most common intervals are 28 days (in 71–p. c.) and 30 days (in 14–p. c.); less frequent are 21 days (in 2–p. c) and 27 days (in 1 + p. c.). We speak therefore of the 21 day *type* and so on. The discharge lasts for a number of days, varying from 2 to 8; if below 2 or above 8 it is abnormal; but of course other points besides mere duration must be taken into account. The duration of the flow and the "type" give the woman's "habit" in menstruation. Women estimate their menstrual loss by the number of diapers used.

LOCAL PHENOMENA.

Local Phenomena.

Three periods are usually distinguished from a clinical point of view: 1. Invasion; 2. Persistence; 3. Decline.

1. *Invasion.*—Discharge pale.

2. *Persistence.*—Discharge bright red, non-coagulable from its mixture with mucus. It consists microscopically of epithelium from vaginal, cervical, and uterine cavities; mucous globules; compound granular corpuscles; and red and white blood-corpuscles.

3. *Decline.*—Discharge lessens in amount and becomes brighter in colour.

The total *quantity* varies from 2 to 8 ounces.

Thus far we have related facts fairly well ascertained and not much disputed. We now enter on more debatable ground, in considering—

I. Ovulation.

II. The Corpus luteum.

III. Source of discharge, and changes in the uterine mucous membrane.

Ovulation

I. *Ovulation.*—According to the ovulation theory, ovulation forms the starting-point of the process of menstruation. We have already considered the structure and development of the ovary, and now describe

The changes in the Ovary at each Menstrual Period.—A Graafian follicle enlarges and moves nearer the surface. Probably this produces, through a nervous mechanism, a hyperæmia of the whole pelvic contents,—peritoneum, connective tissue, uterus, ovaries, Fallopian tubes, and vagina. It is alleged, as yet on insufficient grounds, that the fimbriated end of the Fallopian tube grasps the ovary, and that the ovum from the ruptured Graafian follicle passes into it and along the tube to the uterine cavity. In the Fallopian tube and uterus the action of the cilia is towards the external os (Hofmeier), and we thus get a current in the peritoneal serum which carries the ovum into the uterine cavity. However it reaches the Fallopian tube and uterus, its further development depends on its fertilisation or non-fertilisation. In the latter case it passes off unnoticed in the menstrual discharge; in the former it develops into the fœtus.

Strassmann, who, by injecting gelatine into the ovaries of bitches, increased intraovarian pressure, states that he found changes in the endometrium and some phenomena analogous to "heat," hyperæmia of the vagina and external genitals, erection of the clitoris and increased mucous secretion.

Corpus luteum.

II. *The Corpus luteum.*—After the rupture of the Graafian follicle, we get its cavity filled up by the structure known as the corpus luteum. It varies according as pregnancy does or does not follow its formation. The difference is well given in Dalton's table, which we subjoin.

	CORPUS LUTEUM OF MENSTRUATION.	CORPUS LUTEUM OF PREGNANCY.
End of three weeks.	12 by 13 mm. in diameter; central clot reddish; convoluted wall pale.	
One month.	Smaller; convoluted wall bright yellow; clot still reddish.	Larger; convoluted wall bright yellow; clot still reddish.
Two months.	Insignificant cicatrix.	12 by 22 millimetres in diameter; convoluted wall bright yellow; clot perfectly decolorised.
Four months.	Absent or unnoticeable.	18 by 22 millimetres in diameter; clot pale and fibrinous; convoluted wall dull yellow.
Six months.	Absent.	Still as large as at the end of the second month; clot fibrinous; convoluted wall paler.
Nine months.	Absent.	10 by 13 millimetres in diameter; central clot converted into a radiating cicatrix; external wall tolerably thick and convoluted, but without any bright yellow colour.

The corpus luteum is formed by proliferation of the cells of the membrana granulosa, by the sprouting of new capillaries with migratory cells into the hypertrophied convoluted epithelium. The central portion degenerates into gelatinous tissue, the cortical into fatty tissue (*Klein and Smith*). It thus consists of a vascular framework, with a yellow pigmentary and cellular substance.

Source of Discharge.

III. *Source of Discharge and Changes in the Uterine Mucous Membrane.* — It is generally agreed that the mucous membrane of the uterine cavity is the source of the discharge, *i.e.*, that it comes from the area limited by the uterine ends of the Fallopian tube and the os internum.[1]

Now begins the divergence.

Williams' View.

(1.) Sir J. Williams holds that "uterine contraction drives the blood from the muscular wall into the mucous membrane; the vessels of this membrane, having undergone fatty degeneration, give way, and extravasation of blood results. This extravasation takes place always near the surface, for in that situation the degenerative change has most advanced. The rush of blood into the vessels of the mucous membrane expels the contents of the glands, together with the greater part of their lining epithelium. . . . . When hæmorrhage has taken place into the membrane, it undergoes rapid disintegration, and becomes entirely removed." The new mucous membrane "is produced by proliferation of the elements of the muscular wall of the organ: the muscular fibres producing the fusiform cells; the connective tissue, the round cells; and the groups of round cells in the meshes formed by the muscular bundles, the glandular epithelium." These "groups of round cells" may be the terminations of the uterine glands.

In a later paper,[2] Williams modified the statement of his view by affirming that the greater portion of the muscular wall of the uterus represents the muscularis mucosæ. According to this, only the glandular portion of the mucous membrane is shed.

Entire removal of the mucous membrane down to the muscular fibre, and its regeneration from groups of round cells in the muscular coat, are the essentials of Williams' view.

Kundrat and Engelmann's View.

(2.) Kundrat and Engelmann thus describe the changes.

Mucous membrane becomes swollen and pulpy, and measures in thickness 3–6 mm. The thickness is most marked at the fundus and central portions of the anterior and posterior surfaces. The surface is puffy and injected; glands are distinctly seen on section as fine spirals.

Microscopically, this increase in thickness is seen to be due to a proliferation of the round cells of the stroma, an enlargement of all the cell elements in the superficial layers, and an increase of the intercellular substance. This superficial layer has grown far above the original gland openings, causing the funnel-shaped depressions or small pits seen on surface view. The glands are increased in thickness and length. The vessels are enlarged and gorged with blood. Fig. 54 shows the mucous membrane of the menstruating uterus magnified 40 times.

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[1] A discharge from the tubes has been noted in some cases of inverted uterus.

[2] On the Circulation of the Uterus, etc.: Lond. Obs. Trans., 1885.

The increase of the thickness of the mucous membrane begins as the time of menstruation approaches, is most marked during the period itself, and gradually decreases after the cessation of the catamenial flow.

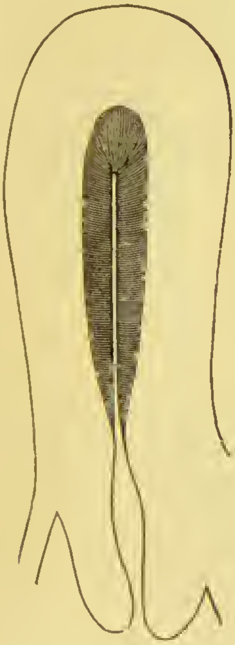

FIG. 52.

DIAGRAM of UTERUS just before MENSTRUATION. The shaded portion represents the MUCOUS MEMBRANE (*J. Williams*).

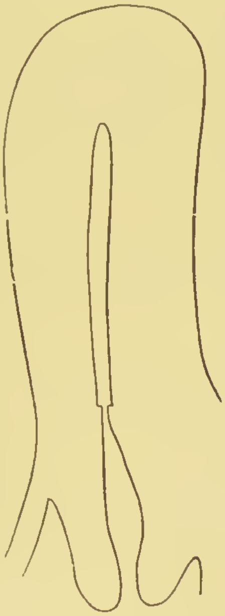

FIG. 53.

DIAGRAM of UTERUS when MENSTRUATION has just ceased, showing the cavity of the body deprived of MUCOUS MEMBRANE (*J. Williams*).

Fatty degeneration takes place in the cells of the interglandular tissue, blood-vessels, and glandular and surface epithelium.

They hold that "the hæmorrhage is always confined to the surface of the lining membrane, and is due to the fattily degenerated tissue being unable to resist the blood pressure"; and *they therefore maintain, what is most probably the case, that only the superficial layer of the mucous membrane is shed at a menstrual period.*

Leopold's View.

(3.) Leopold denies the existence of any fatty degeneration of the superficial layers of the mucous membrane. He believes that an extravasation of red and white blood corpuscles from the superficial capillaries takes place especially towards the superficial layer, undermining the uppermost layer of cells; and that, finally, the copious supply of blood reaching these capillaries from the numerous arteries causes rupture and bleeding. The mucous membrane is regenerated by an upward growth of the glandular epithelium.

Möricke's View.

Williams, Kundrat, Engelmann, and Leopold examined uteri from *post-mortem* cases. Möricke has curetted the uteri of living women at various stages of menstruation, and microscopically examined what he removed. He asserts "that during menstruation the mucous membrane disappears neither partially nor fully." This shows how widely microscopists vary. Williams says all the mucous membrane down to the uterine muscle is removed; Kundrat, Engelmann, and Leopold say only the superficial layers are removed; and Möricke says none is removed.

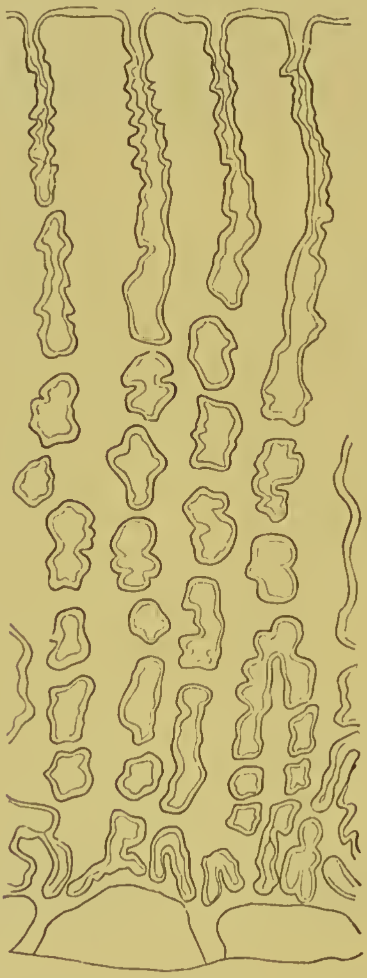

Fig. 54.

Mucous Membrane of Menstruating Uterus (*Kundrat and Engelmann*). ($\frac{40}{1}$)

We have deemed it best to lay these views before the student. The subject is difficult to investigate, and one on which the authors are not qualified to give an opinion. They incline, however, to the views of Kundrat, Engelmann, and Leopold.

A dispute still exists as to which ovum is fertilised when pregnancy occurs—the ovum of the last menstruation, or that of the first period missed. Many observers believe in Loewenhardt's theory—viz., that the ovum fertilised is that of the first period missed.

In the earliest impregnated ovum known, that of Peters of Vienna, the age is considered to be three to four days, but this was *at the first period missed*, as the last menstruation was on 1st September 1898, morning sickness end of September; death by suicide, 1st October. Had the woman conceived immediately after menstruation the embryo would have shown about a month's development.

The dominant influence of the ovary in menstruation has been questioned by some, notably by Lawson Tait. The operation of salpingo-oophorectomy, where both ovaries are removed, does not always cause a cessation of bleeding. It is a broad fact, however, that if the ovaries be completely removed and no ovarian tissue left, not even in the bite of the ligature, menstruation usually ceases.

Leopold's monograph is illustrated by many valuable lithographs, and the same may be said in regard to Dalton's work on the Corpus Luteum.

Menstruation in Monkeys.—It has long been known that monkeys menstruate. Recently more exact details have been given by Bland Sutton and Heape. Sutton examined the uteri of menstruating monkeys (Macacus Rhesus) in the London Zoological Gardens, and found blood in the cavity, but no loss of epithelium.

Heape, who obtained his material in Calcutta, investigated the uteri of Semnopithecus Entellus (fifty specimens). The mucosa of the resting uterus is a plasmodium of anastomosing nuclei with surface and glands lined with columnar epithelium. During the period of growth he found the stroma increased, and the blood-vessels behind the epithelium engorged. The hypertrophied vessels undergo amyloid, not fatty degeneration, and the number of leucocytes increase in the blood-vessels below the surface, probably from the presence in the blood of some noxious material. The blood extravasated by rupture of these blood-vessels collects in spaces or lacunæ, which then rupture through the surface. In this way the superficial layer of the mucosa is cast off (mucosa menstrualis), and then regeneration takes place. Some of the new epithelium seems to be formed from the stroma, the rest from pre-existing epithelium, and leucocytes take no part in the formation of the new lining of the uterus. Many other interesting points are discussed, and the whole monograph is most valuable. He divides the phenomena of menstruation as follows:—

A.—*Period of Rest.*
  Stage I. Resting Stage.
B.—*Period of Growth.*
  Stage II. Growing Stroma.
  ,, III. Increase of Vessels.
C.—*Period of Degeneration.*
  Stage IV. Breaking down of Vessels.
  ,, V. Formation of Lacunæ.
  ,, VI. Rupture of Lacunæ.
  ,, VII. Formation of Menstrual Clot.
D.—*Period of Recuperation.*
  Stage VIII. The Recuperation Stage.

SECTION II.

PHYSICAL EXAMINATION OF THE FEMALE PELVIC ORGANS.

IN this section we have to take up the physical examination of the female pelvic organs—that is, exploration by the hands and instruments of the gynecologist. This will be considered in the following manner:—

CHAPTER VIII. Abdominal Examination; Vaginal Examination; the Bimanual Examination, with its various modifications; Examination per Rectum.

" IX. The Volsella.

" X. Vaginal Specula.

" XI. The Uterine Sound.

" XII. Tents and other Uterine Dilators.

" XIII. The Curette.

" XIV. Knives; Scissors; Needles; Sutures; Douches and Syringes.

" XV. Antisepsis; Asepsis.

CHAPTER VIII.

ABDOMINAL EXAMINATION; VAGINAL EXAMINATION; THE BIMANUAL EXAMINATION, WITH ITS VARIOUS MODIFICATIONS; EXAMINATION PER RECTUM.

LITERATURE.

Hegar—Die operative Gynäkologie, zweite Auflage: Stuttgart, 1881. *Kelly, H. A.*—A New Method of Examination and Treatment of Diseases of the Rectum and Sigmoid Flexure, Annals of Surgery, April 1895; Operative Gynecology: Appleton & Co., New York, 1898. *Cunningham, D. J.*—Delimitation of the Regions of the Abdomen, Jour. of Anatomy and Physiology, Vol. XXVII., 257.

In a female patient whose symptoms point to a pelvic cause, it is necessary to investigate the case by what is commonly known as a vaginal examination. A mere vaginal examination, however, gives very little information. The proper method is first to make an external abdominal examination and then the vaginal examination, the latter being only a stage of the more complete method of investigation known as the bimanual. Special cautions as to cases unsuitable for pelvic exploration are given under the head of vaginal examination. We consider the examination in the following order:—

I. External abdominal examination;
II. Inspection of external genitals (only when necessary);
III. Vaginal examination;
IV. The bimanual (abdomino-vaginal) examination.

EXTERNAL ABDOMINAL EXAMINATION.

External Abdominal Examination.

The patient should lie on the back, with knees drawn up, and head supported on a pillow. The bowels and bladder should be empty. The abdominal surface should be exposed from the epigastrium downwards; no part of the mons veneris should be uncovered. The most delicate method of accomplishing this is as follows. A sheet or blanket is thrown over the recumbent patient; beneath this she raises up her dress as far as the pit of the stomach; the examiner then places his one hand on the sheet, a little above the mons veneris, and turns it down over it with his other hand. The abdominal surface is examined in four ways, viz., inspection, palpation, percussion, auscultation.

Inspection.

A. *Inspection.*—The form, colour, equality or inequality of bulge of the abdominal surface should be noted; the presence or absence of the linea nigra, lineæ albicantes (fresh and old), pigmentary deposits, fat streaks, and skin eruptions. The linea nigra has little significance. The lineæ albicantes indicate that the patient's abdominal cavity is or has been distended beyond the normal. They are not specially characteristic of pregnancy. Fresh lineæ albicantes are glistening and pearly; old ones have a dull white or scarred appearance. It should also be noted whether the abdominal walls move freely with respiration, or are held rigid as in peritonitis.

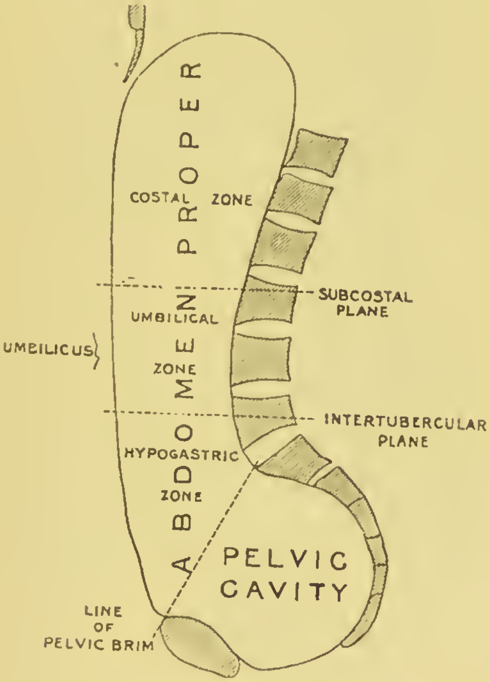

FIG. 55. (*D. J. Cunningham.*)

Palpation.

B. *Palpation* should be performed with both hands. For this purpose the hands, well warmed, are laid flat on the abdominal surface; and the whole area is manipulated between them. One hand alone is of little use. By this method the abdominal contents may be compressed and moved between the hands. The feeling given normally is that of manipulating a plastic fluid. Tapping with one index finger so as to give a fluctuating impulse to the other hand is of great value. Circumscribed nodules or tumours, fluid collections, thickening of the skin, should be noted and mapped out on the scheme given in the chapter on case-taking.

Abdominal Regions.

For the more exact localisation of the normal and abnormal abdominal contents, anatomists divide the anterior abdominal surface into definite regions by vertical and transverse lines. The lower transverse line is drawn at the level of the most prominent lateral point of the iliac crest when viewed from the front (Cunningham)—this is the inter-tubercular plane; the upper one joins the most prominent parts of the tenth costal cartilages—(subcostal plane). A vertical line joining the cartilage of the eighth rib with the middle of Poupart's ligament on each side, completes the division into nine areas, which are named in order as follows (*vide* Figs. 55 and 56).

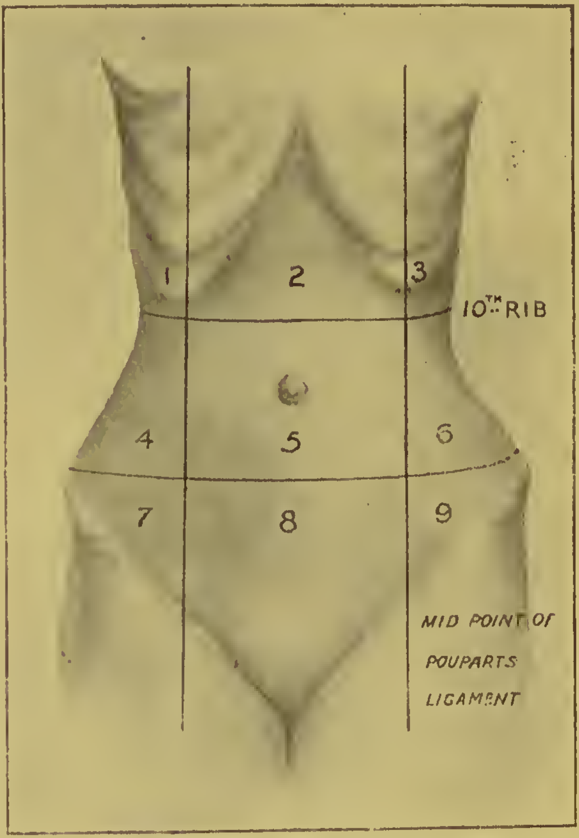

FIG. 56. (*D. J. Cunningham.*)

1. Right Hypochondriac. 2. Epigastric. 3. Left Hypochondriac.
4. ,, Lumbar. 5. Umbilical. 6. ,, Lumbar.
7. ,, Iliac. 8. Hypogastric. 9. ,, Iliac.

In fixing the lower transverse line we have followed Cunningham, who places this line a little higher than usual.

In these regions the following structures approximately are found:—

Epigastric Region.—The greater part or the whole of the left lobe, and part of the right lobe of the liver, with the gall-bladder, part of the stomach, including both orifices, the first and second parts of the duodenum, the duodeno-jejunal flexure, the pancreas, upper or inner end of the spleen, parts of the kidneys, and the suprarenal bodies.

Right Hypochondriac.—The greater part of the right lobe of the liver, the hepatic flexure of the colon, and part of the right kidney.

Left Hypochondriac.—Part of the stomach, with the greater portion of the spleen and the tail of the pancreas, the splenic flexure of the colon, part of the left kidney, and sometimes a part of the left lobe of the liver.

Umbilical.—The greater part of the transverse colon, the third part of the duodenum, some convolutions of the jejunum and ileum, with portions of the mesentery and great omentum, and part of the right, or sometimes of both kidneys.

Right Lumbar.—The ascending colon, part of the right kidney, and sometimes part of the ileum.

Left Lumbar.—The descending colon, part of the jejunum, and sometimes a small part of the left kidney.

Hypogastric.—The convolutions of the ileum, the bladder in children, and when distended in adults also, the uterus when in the gravid state, and behind, the sigmoid loop and upper part of the rectum.

Right Iliac.—The cæcum with the vermiform appendix, and the termination of the ileum.

Left Iliac.—The sigmoid colon, convolutions of the jejunum and ileum (*Quain*).

The student must remember that the bladder and the uterus and appendages in the non-gravid conditions lie below the pelvic brim.

For the relations of the lower regions of the abdomen to the pelvic contents, the student may consult fig. 37, which shows very well the latter as seen through the brim.

In palpating the normal abdomen, the sensation given is one of impulse communicated generally through a plastic fluid. When free fluid is in the abdominal cavity, the impulse is more distinct. When the fluid is encysted, the impulse and tense feeling are localised.

When any large body is felt in the abdominal cavity, the first point to be determined is whether the body is pelvic or abdominal. This is easily done by attempting to press the hand downwards just above the symphysis pubis. If the tumour is pelvic, and rising up into the abdomen, the hand cannot be so pressed; while it can be if the tumour is purely abdominal.

The next point is to ascertain with which of the organs the tumour is connected; and, for this, perfect familiarity with the topography of the viscera is of the highest importance. The student should ask himself what structures are normally present in the region, and then to which of these the tumour is to be referred; with regard to the iliac regions he should bear in mind the frequency of inflammatory and suppurative deposits in the peritoneum and cellular tissues. Appendicitis must also be kept in mind.

In all tumours, the existence or non-existence of intermittent contractions should be carefully noted. Their presence indicates a uterine tumour—pregnancy or soft fibroid.

The following general points should be kept in mind. The bladder is only in the hypogastric region when distended or displaced upwards; if empty, it is behind the pubes and in the true pelvis; a distended bladder may be as large as a six months' pregnancy. Ovarian tumours are more or less lateral; uterine tumours generally central, although the pregnant uterus has usually a right lateral obliquity. In advanced pregnancy, the parts of the fœtus can be distinctly palpated. Finally, it should be kept in mind that in cases of cystic tumours the catheter may require to be passed into the bladder, for an obvious reason.

CASE.—Mrs A. was sent for consultation as to removal of internal tumour. On examination, a cystic tumour was felt mesially in the abdomen and reaching up to umbilicus. Vaginal and bimanual examinations were exceedingly painful. A catheter passed into the bladder evacuated a large amount of urine. The uterus was now found to be retroverted and gravid 3½ months, and the cystic tumour had disappeared.

Palpation of Groin.

Palpation of the inguinal region is of great importance and should never be omitted. Glandular and other enlargements in this position may be the following:—

(1.) Glands enlarged from gonorrhœa. There are usually one or two—large, painful, and often suppurating.

(2.) Glands enlarged from syphilis. These are multiple, hard, small, painless, and never suppurate in an uncomplicated case.

(3.) Glands enlarged from vulvar malignant disease, or malignant disease of vagina (lowest ¼) or urethra; from sarcoma of pelvis.

(4.) Femoral or inguinal hernia.

(5.) Thrombosis of femoral vein.

Percussion.

C. *Percussion* is to be made in the usual way. To perform this thoroughly, the patient should be percussed (*a*) when on her back; (*b*) when on the left side; (*c*) when on the right side; (*d*) when sitting up. Changes in the percussion note on the patient changing her posture should be carefully noted, as they are of great value (*vide* under Ovarian Tumours and Ascites).

Auscultation.

D. *Auscultation* is performed with the ordinary stethoscope. The fœtal heart, uterine souffle, and friction may be heard by it. The importance of auscultation is evident. Fœtal heart-sounds indicate pregnancy; the point of greatest intensity of the heart-sounds indicates the lie of the child. Uterine souffle and no heart-sounds (after 4½ months) indicate either pregnancy and child dead, or fibroid tumour. Ovarian cysts have no souffle.

Before finishing abdominal examination, the patient should be made to raise her shoulders by grasping the examiner's hands. When there is no encysted abdominal tumour, the recti can be seen to flatten the abdominal contour; if, however, a solid or cystic tumour be present, the contour is unaltered. An exception should be made in the case of thin-walled cysts not tensely filled, where the recti do flatten the contour.

INSPECTION OF EXTERNAL GENITALS.

Inspection of External Genitals.

This should not be made a routine practice. As a general rule, inspection of the genitals should only be made when there is local tenderness, where syphilis or gonorrhœa is suspected, or where it is said by the patient that something comes down at the vaginal orifice. Soft chancres, hard chancres (almost never seen in females), mucous patches, condylomata; urethral caruncles; irritable spots causing vaginismus; labial abscess; new growths; parturition tears of perineum and labia; prolapsed pelvic organs; external or internal piles, may be found.

VAGINAL EXAMINATION.

Vaginal Examination.

Preliminaries.—Vaginal examination should not be made on girls below or little beyond the age of puberty, unless the symptoms are urgent, *e.g.*, mechanical retention of menstrual fluid from atresia. In such cases the consent of the parents or guardians should be obtained, and they should be present at the time of examination. In the case of unmarried women it should not be performed unless specially necessary. In both classes of patients the value of a rectal examination should be kept in mind. The vaginal examination should be made on married women whose symptoms point to a pelvic cause. Finally, no woman should be examined vaginally when menstruating normally, unless under exceptional circumstances.

Special cases require consideration: viz., that of a mistress who requests a medical man to examine her servant, who is suspected of pregnancy; or of a young woman, who, owing to a malicious report, requests examination as to her condition and a certificate that she is not pregnant.

In the first case, it is better for the medical man not to examine the patient, as he may be liable to an action for assault.

In the second case, the medical man should advise the patient against being examined. This latter case is quite different from that of an unmarried woman who, having run the risk of impregnation, requests examination to settle whether she is pregnant. In this instance the medical man investigates the case in the usual way.

After settling these preliminaries, and having obtained the patient's consent to "examine" (a term which will be readily understood by her as meaning a vaginal examination), the next point is to determine the posture the woman is to occupy while the examination is being made.

Position of Patient.

In this country it is customary to place the patient on her left side for the vaginal examination, and in the dorsal posture for the bimanual. The patient lies on a convenient couch, with knees well drawn up and clothes loose. The examiner carefully oils or soaps the index and middle finger of his right hand. With his left hand he clears away the clothes from the hips so as to make a passage for the examining fingers, which he passes onwards till he reaches the cleft between the buttocks. He next passes them forwards over the anus, skin over base of perineum and fourchette, until the pulp of the finger rests at the vaginal orifice. In multiparous women, the lax vaginal orifice is easily felt. When in doubt, he passes his fingers cautiously on until he touches the vestibule, which is always smooth. Carrying his fingers back, he will then reach the vaginal orifice at the base of the vestibule.

The tyro must be careful not to pass his finger into the rectum by mistake. He should remember that the vaginal axis passes backwards, the anal axis forwards; that no force is required to pass the finger into the vagina where the hymen has been ruptured, whereas some force is necessary to overcome the resistance of the sphincter ani. The clitoris, lying at the apex of the vestibule, should never be touched on vaginal examination.

The two fingers, being now at the vaginal orifice, should be carried backwards into the vagina until its upper limits are felt. In doing so, the following points should be noted.

What to note

1. *State of Vaginal Orifice:* patulous or narrow, presence or absence of painful spots, presence or absence of spasm.

2. *Walls:* shape and length; presence or absence of rugæ; moisture, heat, secretion, tumours attached to them; fistulæ; foreign bodies, such as pessaries, glycerine plug, oakum plug.

3. *Cervix:* direction, size, shape, and consistence. Note whether thickened, expanded, and fixed; drawn to one or other side; mobile and not fixed; or whether split and with cicatrices radiating from it to vaginal roof.

4. *Os:* size, shape, consistence of lips. Thus, it may be a dimple, as in nulliparæ; transverse, as in parous women (figs. 11 and 12); or the cervix may be split on one or both sides, and thus no *os externum* be present but the cervical canal be more or less exposed. Bodies pro-

jecting through it should be noted: these may be polypi, fragments of abortion, cancerous masses, stem pessaries.

5. *Posterior fornix* is concave when felt from below. It has normally a feeling like that of the inside of the angle of the mouth. Note if any lump can be felt through it, projecting downwards in Douglas' pouch, rendering the fornix convex. A body or resistance felt through the posterior fornix may be the following:—

Bodies felt through posterior fornix.

(1.) Fæces or tumours in the rectum;
(2.) Acute or chronic inflammatory deposit in the peritoneum or cellular tissue;
(3.) Retroverted corpus uteri (non-gravid or gravid);
(4.) Blood effusion;
(5.) Fibroid attached to posterior wall of uterus;
(6.) Ovary inflamed or cystic;
(7.) Ascitic fluid;
(8.) Extra-uterine fœtation or hydatid (rare).

6. *Anterior fornix.*—Note if there is any body felt through it. If so, it is most probably the corpus uteri, normal or enlarged from pregnancy or fibroid. There may be also inflammatory or blood effusions, or a tender ovary, but these are rare here.

7. *Lateral fornices.*—Note cicatrices, prolapsed or cystic ovary, lateriflexed uterus, inflammatory or blood effusion or gestation in broad ligament, dilatation of Fallopian tubes, fibroids placed laterally.

The vaginal examination has now been completed. The student should keep in mind that he really learns very little from a vaginal examination, just as he can learn very little as to the size and relation of any object by touching it with the fingers on but a limited area. Vaginal examination is thus only the preliminary to the bimanual or abdomino-vaginal.

BIMANUAL (ABDOMINO-VAGINAL) EXAMINATION.

Bimanual.

This method of examination is the all important one in gynecology, and is the one which the student and practitioner will find most valuable, so that its practice should precede all other methods of internal investigation. As the practitioner's experience increases, he will find that he relies more upon this and becomes less dependent on other means of examination.

Method of performing Bimanual. Posture of Patient.—The patient must now be placed in the dorsal posture. The head and shoulders should be supported and the knees drawn up

Arrangement of Examiner's hands.—The *internal* hand (the right) is placed as follows. The fingers (index and middle) are in the vagina, the thumb rests in the fold between the labium majus and the thigh or upon the symphysis, and the other fingers lie in the cleft of the nates (fig. 60) or flexed on the palm (figs. 58 and 59). The whole hand is then rotated backwards so as to bring its long axis as nearly as possible into the axis of the brim, and is then pushed up towards the brim of the pelvis. Thus the pubic segment, uterus with annexa, and posterior vaginal wall are lifted up towards the brim. The middle finger is placed over the os and the index one in the anterior fornix, so that the uterus as it is pushed up becomes more anteverted. The right hand while examining therefore has the appearance at fig. 57. The external hand (the left) is placed on the abdominal wall just above the pubes. It is now steadily depressed until the abdominal wall below it is markedly cupped (figs. 58 and 59) and moulded over the uterus and appendages, which have been elevated by the inner hand. In this way the two hands estimate the size and relations of the pelvic contents, just as one would estimate the size of a watch covered with a cloth. The student should note specially that the upper hand should be steadily and not spasmodically depressed; that he should always keep the ulnar edge of the hand (rather than the palm) towards the abdominal surface, so that he may not retrovert the uterus; and that he should palpate all the abdominal areas along the pelvic brim so as not to miss anything. *His first object in the bimanual examination is to determine where the uterus is*, as this greatly simplifies the recognition of abnormal products in the pelvis. He then bimanually explores the fornices, moving the internal fingers appropriately and noting what he feels. At first his diagnosis should be simply physical, *e.g.*, "uterus felt to front and a large firm lump behind it"; or, "uterus felt retroverted and a small movable tumour on its left side."

Position of Hands in Bimanual.

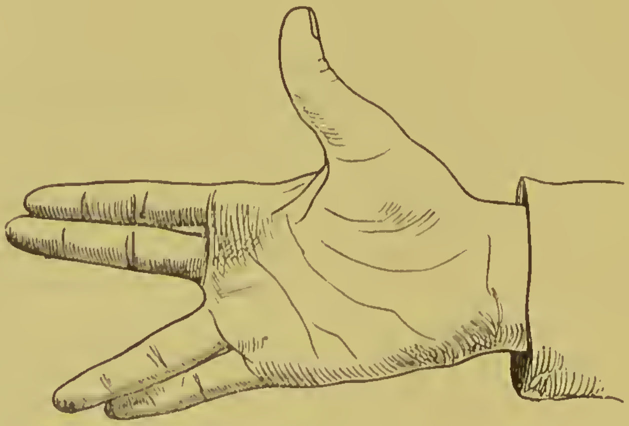

FIG. 57.
RIGHT HAND IN BIMANUAL EXAMINATION.

Normal condition on Bimanual.

It is of importance that the student should know what a "normal bimanual" is. The following is a description of the condition found in a nulliparous married woman on vaginal and bimanual examination.

"Ostium vaginæ patulous, and admits two fingers; vaginal walls moist, rugous, with no abnormalities. Vaginal portion of cervix normal in size (fig. 11): os uteri felt like a dimple, looking downwards and backwards. No bodies are felt through the lateral and posterior fornices which are concave on their vaginal aspects, and have the feeling, on pressure, of the angle of one's mouth. In the anterior fornix a body is felt, which on bimanual examination is discovered to be the uterus lying to the front and not enlarged. The body and cervix meet at a very obtuse angle. Bimanual exploration of the fornices reveals nothing distinctly palpable.[1] The patient complains of no pain during the whole examination."

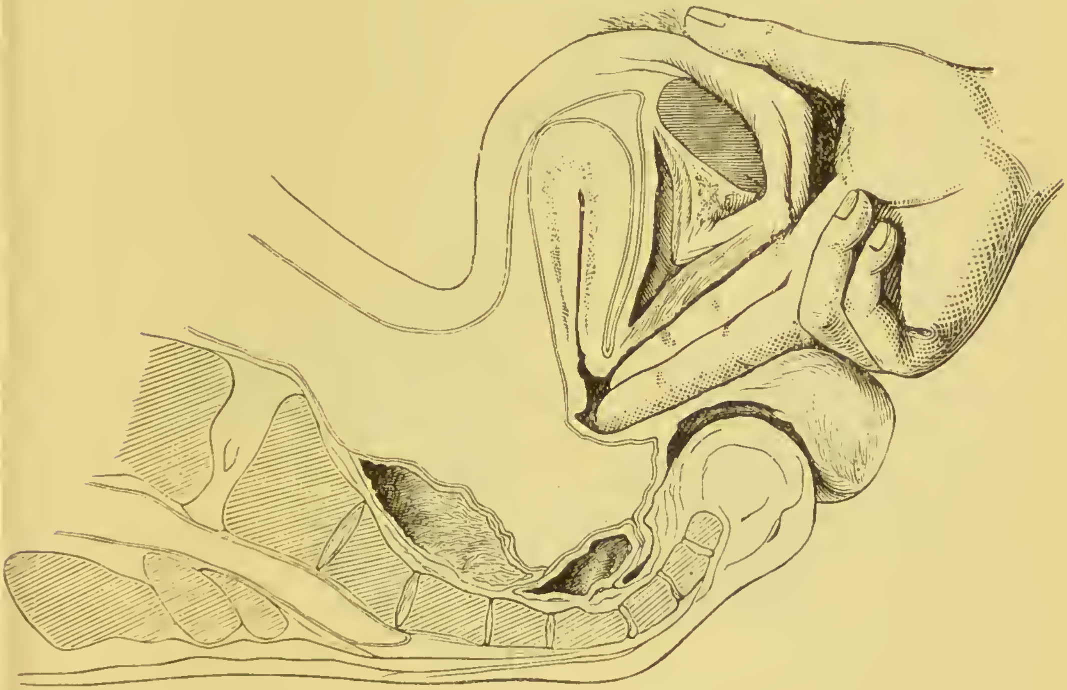

Fig. 58.

Bimanual Examination. The upper hand is not shown. (*Hart*).

Difficult Bimanual. *Cases where the Bimanual is difficult.*—The student will soon find that the bimanual can be performed in certain cases with great facility and accuracy, while in others it is exceedingly unsatisfactory.

The best case for a bimanual is in a patient a fortnight or three weeks after delivery. The reasons for this are evident. The ostium vaginæ and vaginal walls have been rendered lax by the child's head; the pubic segment has been drawn up and its attachments slackened; the abdominal walls have had their elasticity diminished by the full-time uterus, and the uterus itself is not involuted to its normal size. In such a case, there are evidently all the requisites for a good bimanual.

---

[1] One practised in the Bimanual can feel the normal ovaries.

Difficult bimanual cases are found in stout nulliparous women, and in cases of pelvic inflammation. In such the rectal examination (with or without the use of the volsella) is indicated.

Students at first find the bimanual unsatisfactory. By perseverance, however, they will obtain by means of it an accuracy in diagnosis which is astonishing. It is not only the best means of investigation, but one from which no possible harm can arise. In no cases is it contra-indicated except those of advanced cancer or of acute inflammation.

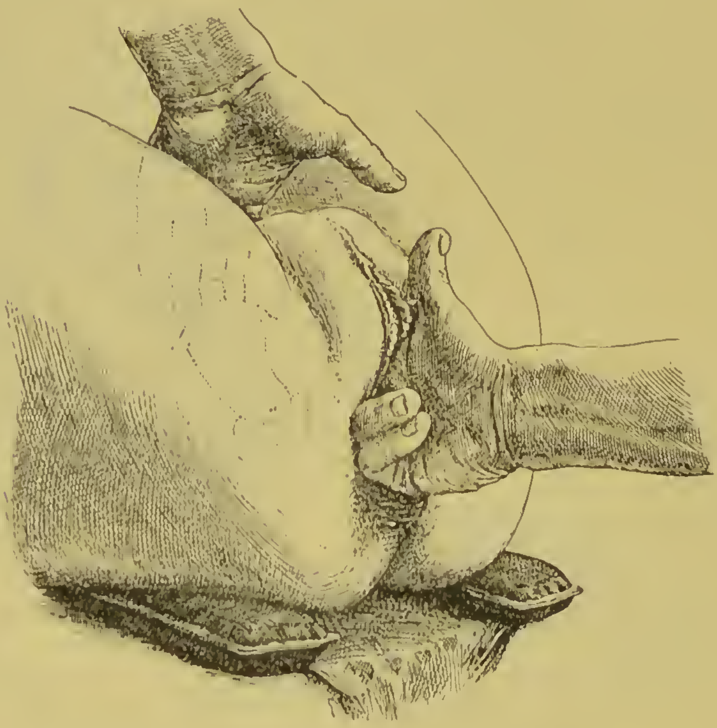

FIG. 59.

BIMANUAL EXAMINATION. Note that the perineum is pressed up by the ring and little fingers of the right hand, thus enabling the fore and middle fingers to reach 1 to 1½ inches higher in the vagina. (*After Kelly*).

Varieties of Bimanual.

We have described the simple abdomino-vaginal examination. It will be readily understood that we may have others, as follows:—

(1.) Recto-abdominal (finger in rectum and left hand above);

(2.) Recto-vagino-abdominal (middle finger in rectum, index finger in vagina, and left hand above);

(3.) Vesico-vagino-abdominal (middle finger in vagina, index in bladder, and left hand above);

Of these the third is never now practised.

Note that in the Bimanual the pubic segment with uterus and its annexa is elevated, the sacral segment shortened, and the abdominal wall depressed. Anatomy of Bimanual.

Before and after the bimanual or other examination, the examiner should scrupulously cleanse his hands, not only to avoid carrying sepsis, but also to guard against his own accidental inoculation, by no means infrequent, with syphilis. There are no better substances for this than turpentine and ordinary soap. The odour is by no means disagreeable, and if found objectionable can be easily covered by vinegar, which in itself is a good cleanser. The hands should finally be vigorously scrubbed with a nail brush (without soap) in corrosive sublimate, 1 in 2000 or 3000. Carbolic lotion (1–40) and soap give also thoroughly good and convenient disinfection.

In examining cancerous cases, where the odour is exceedingly penetrating and persistent, it is a good plan to dip the fingers in turpentine prior to the examination. (*v.* Chap. XV. Antisepsis.)

Rectal Examination.

The results obtained by a vaginal examination are limited by the fact that the reflection of the vaginal walls to form the fornices, prevents the finger being pushed up to a sufficient distance. This defect is compensated for by the downward pressure of the upper hand in the Bimanual; but in cases where the abdominal walls are unyielding or the pubic segment stiff, due pelvic exploration by an abdomino-vaginal examination alone is impossible. In such cases, rectal exploration and the abdomino-rectal or abdomino-recto-vaginal examination are invaluable; they give better information than the more commonly practised abdomino-vaginal.

SIMPLE RECTAL; ABDOMINO-RECTAL; ABDOMINO-RECTO-VAGINAL.

Preliminaries.

Preliminaries.—The patient should be told that it is necessary to examine the bowel. If the rectum is loaded the examination should be deferred till next day, and the patient instructed to use a purgative at night and an enema in the morning.

Manner of Performance.

The following points should be especially noted. The examiner should thoroughly soap the fingers and nails. A vaginal examination may be made first; and then, the index finger being kept in the vagina, the middle one is passed into the rectum (fig. 60). If the patient is virginal, and it is wished to avoid a vaginal examination, then the index finger alone is passed into the rectum. When the finger or fingers are withdrawn from the rectum the hands should be at once cleansed; there can be nothing more hurtful to a patient's feelings than the passing of the uncleansed fingers from the rectum into the vagina. The patient lies first on the left side and then on the back.

Anatomy of Rectal Examination.

The finger passed into the rectum goes forwards; when passed into the vagina, the direction is backwards. After overcoming the resistance of the strong external sphincter it enters the rectal ampulla (fig. 31), which is often expanded by flatus. Passing the finger onwards and to the left side, a confused mass of tissue is felt in which we may detect the opening betwixt the segments of the sphincter tertius.

What to note.

As we pass the finger inwards we note piles (internal and external), fissures, polypi, ulcers, stricture (specific and malignant).

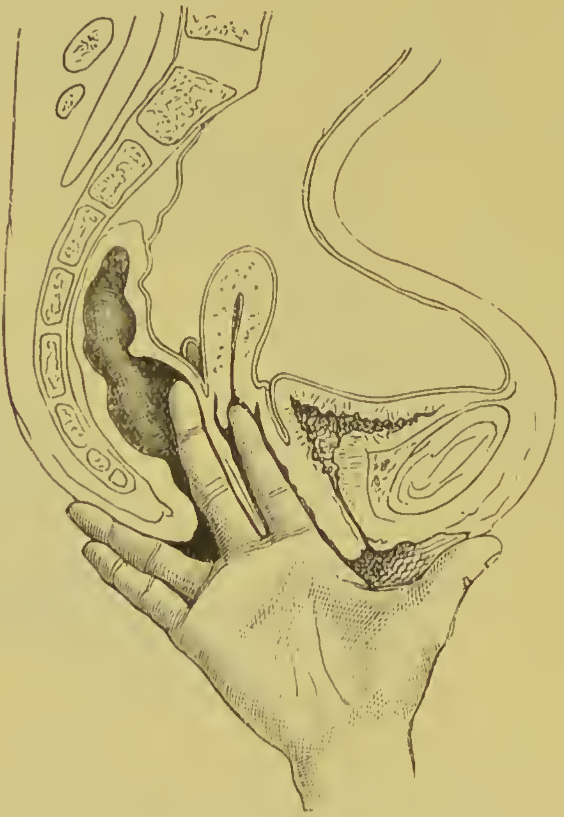

Fig. 60.

Abdomino-recto-vaginal Examination. Upper hand not shown. Note prolapsed ovary.

We next turn the pulp of the examining finger so that it lies on the anterior rectal wall. Through this can be felt the cervix. Note that the whole cervix is felt, and that it is much larger than the vaginal portion felt on vaginal examination. Be sure not to mistake it for the body of the uterus. If the uterus lies to the front, its forward direction can be noted; if to the back, then the body will be felt on passing the finger further up. Pushing the finger well upwards and passing it first to the right and then to the left, we feel the ovaries (more distinctly when enlarged) as small oval tender bodies (figs. 60 and 37).

Fig. 77 shows a common condition of the uterus which is frequently mistaken for and treated as a retroversion. We allude to the uterus anteflexed and drawn back by cellulitis of the utero-sacral ligaments. As such patients are usually nulliparous and have therefore somewhat unyielding abdominal walls which cause a difficult bimanual, and as a lump is felt through the posterior fornix, the diagnosis of retroversion is often made. The rectal examination, however, clears up the case; as the finger feels the knee of the flexion and the uterine body going forwards from it.

Value of Rectal Examination.

Diagnosis of Anteflexion.

The *upper hand* is used during the rectal examination just as in the Bimanual, *i.e.*, the examination is abdomino-recto-vaginal or abdomino-rectal. The simple rectal (with the finger in the rectum unaided by the other hand) does not give much information as to the condition of the uterus.

Where, from rigidity of the abdominal walls, it is difficult to press down or fix the uterus with the external hand, this may be done with the volsella in the vagina. The use of the volsella enables us to draw the uterus better within reach of the finger in the rectum. This examination per rectum aided by the volsella will be considered in the next chapter.

Of all manual examinations of the pelvis, the abdomino-rectal or abdomino-vagino-rectal is the most thorough. In retroversion, prolapsed ovaries, and pathological anteflexion, it is of special value. A patient may object to it and refuse to allow it; and, of course, the practitioner must keep this in mind. In cases where difficulty is experienced and the diagnosis not clear, an anæsthetic should be given. This is of great value.

For specialists it is of use to know that valuable results in minute precise rectal examination can be got by first injecting air into the rectum. The whole rectum up to the sigmoid flexure can be dilated, the sphincters made out and the bony pelvic wall carefully explored. It is necessary to add, however, that this is an adjunct to the rectal method of examination of use only in certain very rare instances. As this method is one for examination of the rectum itself, we shall defer its consideration until the chapter dealing with that subject (*Vide.* Chap. LV.)

Injection of Air.

CHAPTER IX.

THE VOLSELLA.

LITERATURE.

Goodell—Some Practical Hints for the Treatment and the Prevention of the Diseases of Women: Medical and Surgical Reporter, January, 1874. *Hegar*—Zur gynäkologischen Diagnostik: Die combinirte Untersuchung, Volkmann's Sammlung, No. 105. *Simpson, A. R.* The Use of the Volsella in Gynecology: Contributions to Obstetrics and Gynecology, p. 183. The literature is fully given in A. R. Simpson's paper.

Volsella.

We have already seen that one of the most striking anatomical features and properties of the uterus is the considerable range of its mobility in almost every direction. It can be pushed upwards from its normal position 1½ or 2 inches, and is displaceable forwards or laterally in a very marked degree. If laid hold of with the instrument known as a volsella it can be drawn downwards (by a force not exceeding five or six pounds) until the os externum lies close to the vaginal orifice. This procedure facilitates, in suitable cases, diagnosis and treatment in gynecology so much that it is well worthy of the allotment of a special chapter to its discussion. We consider the following points:—

1. Description of instrument (fig. 61);
2. Method of use;
3. Mechanism of the displacement it causes;
4. Uses;
5. Contra-indications.

Description of Volsella.

1. *Description of Volsella.*—Probably the best pattern of volsella is the one used in Germany, and known as the bullet forceps. It is a straight instrument, is provided with a catch, and has a bite that does not tear. There are, however, very many varieties of volsellæ, and the practitioner in choosing one should note that the bite is not too fine, and should consider a simple catch indispensable. As it is generally the anterior lip of the cervix that is laid hold of, and the volsella lies along the straight anterior vaginal wall, the slight pelvic curve usually given to the instrument is unnecessary.

Method of Use.

2. *Method of Use.* (*a*). *Without previous passage of Speculum.*—The patient is placed in the ordinary left lateral posture. Two fingers of

the right hand are passed into the vagina, and the anterior lip of the cervix touched. The volsella, held in the left hand, is guided along between the index and middle exploring fingers; the anterior lip of the cervix is seized and drawn down. Rectal examination is now made. This plan is also useful in cases where the hymen is rigid, and where dilatation of the cervix is being employed for dysmenorrhœa. (Section VIII.)

(*b.*) *With the Speculum.*—For this see Chapter X.

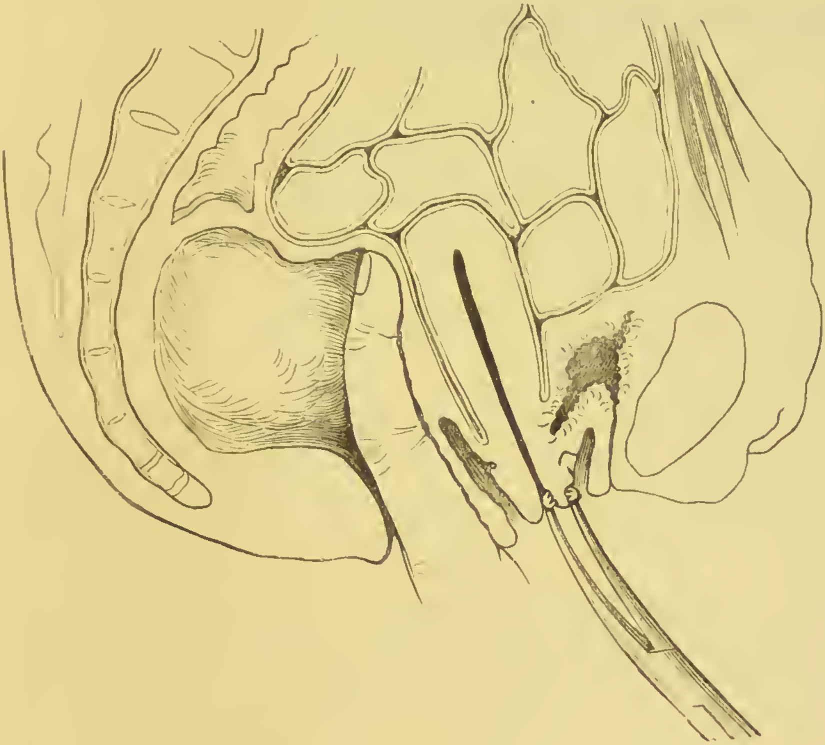

Fig. 61.

Mechanism of Displacement of Pelvic-Floor Segments when Volsella is used.

Mechanism of the Displacement caused.

3. *Mechanism of the displacement it causes.*—The uterus is drawn down so as to lie behind the symphysis pubis. If drawn down fully, as it may be in exceptional cases, it has its long axis in the vagina and the os externum near the vaginal orifice.

The vaginal walls are inverted: *i.e.*, when the os externum is at the vaginal orifice, we have a deep pouch behind and in front of the uterus.

The relations of the bladder and rectum are given in fig. 61.

Use in Diagnosis.

4. *Uses.* (*a*) *In diagnosis.*—(1.) The cervix, which may seem "ulcerated," as it is commonly called, is easily demonstrated by the volsella to be singly or doubly lacerated. For this purpose the anterior and posterior lips are laid hold of, and when brought together the alleged ulceration is seen to be really laceration with eversion (*v.* Chap. XXIX.).

(2.) Abdominal tumours can be shown to be connected with the uterus or not as the case may be. If the patient be placed in the dorsal posture and the tumour be laid hold of by an assistant, then, when the uterus is drawn down, the tumour can be felt to descend, if fixed to it.

(3.) To the examination *per rectum* the volsella is a valuable addition. If one finger be placed in the rectum and the cervix laid hold of with a volsella and drawn down, the mobility of the uterus can be estimated; the whole posterior uterine surface may be palpated for small fibroids. The ovaries are made more accessible; and the uterus, especially if small, can have its length estimated by the rectal finger.

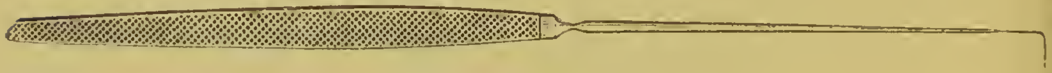

FIG. 62.
SIMS' TENACULUM.

This method of examination of the uterus by rectum and volsella, judiciously conducted, is of the very greatest value.

It is evident that it will also help one as to the diagnosis of displacements of the uterus; but its value in this respect is somewhat lessened by the displacement its use causes. Thus it makes a retroversion less retroverted; an anteflexion less anteflexed; an anteversion less anteverted.

Use in Treatment.

(*b*) *In treatment.*—In this the volsella is one of the most useful instruments the gynecologist possesses. Thus it helps greatly in the examination of the aborting uterus; in replacement of the gravid or non-gravid retroverted uterus; in insertion of sponge or tangle tents. In operations such as Emmet's for repair of the cervix, amputation of vaginal portion of cervix, excision of the uterus through the vagina, it is indispensable.

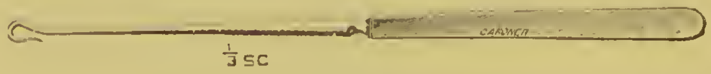

FIG. 63.
KELLY'S SHEPHERD'S CROOK TENACULUM.

Details of its uses in these cases will be given under the special descriptions of the operations; and it will also be shown, in the Chapter on Specula, that by using the volsella the speculum may be dispensed with in certain cases.

Contra-indications.

5. *Contra-indications.*—It should not be used in acute peritonitic or cellulitic attacks, where there are distended Fallopian tubes, in cases of hæmatocele, or advanced cancerous disease. No pain should be caused

by its use provided only the vaginal aspect of the cervix is laid hold of.

Amount of traction to be used.

The amount of traction to be made will vary with the necessities of the case. In many instances only a mere steadying action is requisite; in others the cervix has to be drawn half-way down the vagina. In special cases the cervix is drawn down to the vaginal orifice or beyond it, as in amputation of the cervix or excision of the uterus.

For simply steadying the cervix, *Sims' tenaculum* is of great service (fig. 62). This is a form of sharp hook with a delicately made stem, diminishing to the point which is set on the stem almost at a right angle; the hook should be only very slightly curved in. In operating on carcinoma cervicis uteri, the volsella is occasionally unsuitable as the tissue is too friable. A hook may be passed into the cervical canal in such cases so as to draw down the uterus sufficiently. We also show at fig. 63 Kelly's shepherd's crook tenaculum, useful in perineal operations.

CHAPTER X.

VAGINAL SPECULA.

LITERATURE.

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Vaginal Specula.

WE have already seen that the segments of the pelvic floor are separable when a woman assumes certain postures; that the sacral segment can be hooked up, and that by this means we get a view of the vaginal boundaries of these segments and of the cervix. This is the natural method of opening up the pelvic floor; or the natural specular method.

Gynecologists had used various instruments for enabling them to look into the vagina; but all these proved unsatisfactory until Marion Sims, noting the natural postural dilatation of the vagina, introduced his famous duckbill speculum.

Varieties.

We take up the consideration of three types of speculum, viz.:—

1. Spatular—the duckbill or Sims' speculum;
2. Tubular—the Fergusson speculum;
3. Bivalve—the Neugebauer, Cusco, and other modifications.

We note under each its nature, the method of employing it, and the theory of its action and uses.

Sims' Speculum. Nature.

1. The SIMS' or DUCKBILL SPECULUM is shown at figs. 64 and 65.

Its Nature.—Each instrument in reality consists of *two specula*, which are of different size and connected by a handle; usually, however, we speak of these specula as the *blades* of the *speculum*. The real Sims' speculum is light, has each blade slightly concave on its anterior aspect, and has the blades at *right* angles to the intermediate handle.

Modifications. Bozeman's.

Modifications of Sims' speculum are numerous. Indeed, it seems difficult for gynecologists to resist modifying an instrument, and rare to find them improving it. The most widely known modification is Bozeman's; it is heavier than Sims', has the blades meeting the handle at an acute angle, and the blades more concave on the anterior aspect. (Figs. 65 and 66.)

The most valuable improvements in specula have been made to meet the necessities of such operations as vaginal hysterectomy and amputation of the cervix. Thus a speculum for use in the lithotomy posture in these operations has been developed from Sims' and become indispensable in such work. It is shorter, broader, and may have various blades fitting one handle with a convenient catch, or the blade and handle may be in one piece (fig. 68). These allow the drawing down of the uterus, and dilate the vaginal entrance for freer manipulation in a way the Sims' speculum cannot, and are thus an absolute necessity in certain cases.

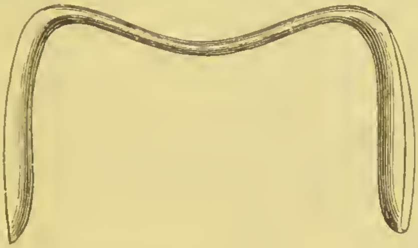

FIG. 64.
SIMS' SPECULUM.

Method of Use.

The method of employing Sims' speculum.—Under this it is important to note (*a*) How to place the patient, (*b*) How to pass the speculum, and (*c*) How to hold it when passed.

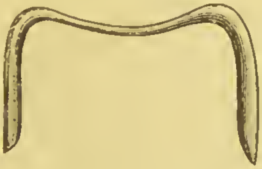

FIG. 65.
SIMS' SPECULUM.

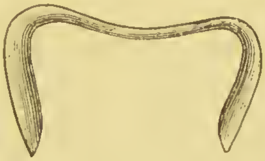

FIG. 66.
SIMS' SPECULUM modified by BOZEMAN.

Position of Patient.

(*a*) *How to place the patient.*—The patient must be placed in the Sims or semiprone posture. This is briefly as follows: the patient lies almost on the breast; *the lower left arm is over the edge of the couch* next the gynecologist; the hips are close to the edge; the knees are well drawn up; and the *upper or right knee touches the couch with its inner aspect.* The posterior aspect of the sacrum is therefore oblique to the horizon.

As the result of this posture—a modified genupectoral one—the vaginal walls separate when air is admitted; the pubic segment passing down with the viscera, the sacral one remaining behind.

Passage of Speculum.

(*b*) *How to pass the speculum.* — Choose the blade which is of the proper size to pass the vaginal orifice; warm it, and oil it with the fingers on its convex aspect only. The concave surface must be dry to reflect light, and therefore the speculum should not be oiled by dipping it. Hold it by the other blade in the left hand, as shown at fig. 67. Then pass the index and middle fingers of the right hand into the vagina to separate the labia and dilate the vaginal entrance; carry in the speculum between them; push it onwards, following the curve of the posterior vaginal wall, until the beak of the instrument lies in the posterior fornix. Now draw the instrument back as a whole, in a direction at right angles to the posterior vaginal wall; then turn the beak forwards, so as to bring the cervix more into view. Finally, tilt the blade so that the beak lies on a lower level than the proximal end of the blade; this keeps up the upper labium.

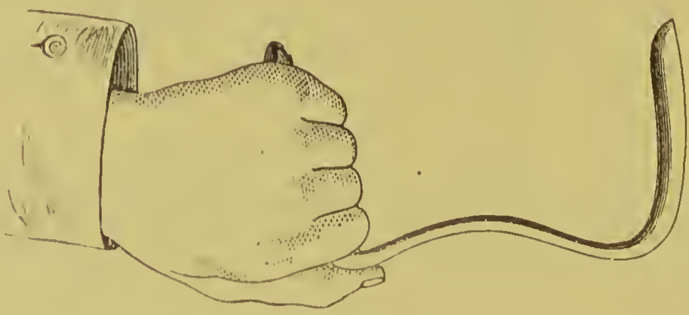

FIG. 67.

One method of holding the SIMS' SPECULUM.

How it is held.

(*c*) *How to hold the speculum when passed.* — When passed, the speculum may be held as shown in fig. 67, or the hand may rest on the patient's hip while grasping the instrument; the cervix may be drawn down with a volsella. A modified self-retaining duckbill speculum has been designed by Auvard. The blade meets the handle at a more acute angle than usual, and a spherical and heavy piece of lead is fixed on the handle. When the speculum is introduced it can thus be left unheld when the patient is in the lithotomy posture. One disadvantage is that it may tear the perineum.

Auvard's Speculum.

Action and Uses of Sims' Speculum.

Theory of action and uses of the Sims' speculum.—The Sims' speculum is based on the effects consequent on the genupectoral posture. When the patient is semiprone and the vaginal orifice opened, the segments of the pelvic floor separate; and then the Sims' speculum is a simple means of hooking the sacral segment well back.

The Sims' speculum is, on the whole, by far the most useful speculum for examination and for operative work not requiring downward traction on the uterus and great dilatation of the vaginal entrance.

If the operator is single-handed in performing, *e.g.*, such an operation as curetting, he may fasten the volsella with a tape to the sheet on which the patient lies. He can then hold the speculum with his left hand and this leaves the right for manipulation.

Fergusson Speculum.

2. The FERGUSSON SPECULUM is seen at fig. 69. It is made in three suitable sizes; and may be described as a glass tube, with a proximal trumpet and a distal bevelled end. It is made of glass, silvered on the inside and coated with caoutchouc. The bevelling of the distal end makes a shorter anterior side and a longer posterior one. The maker's name is usually placed at the trumpet end, at the foot of the anterior side, and serves to indicate that side when the speculum is in the vagina.

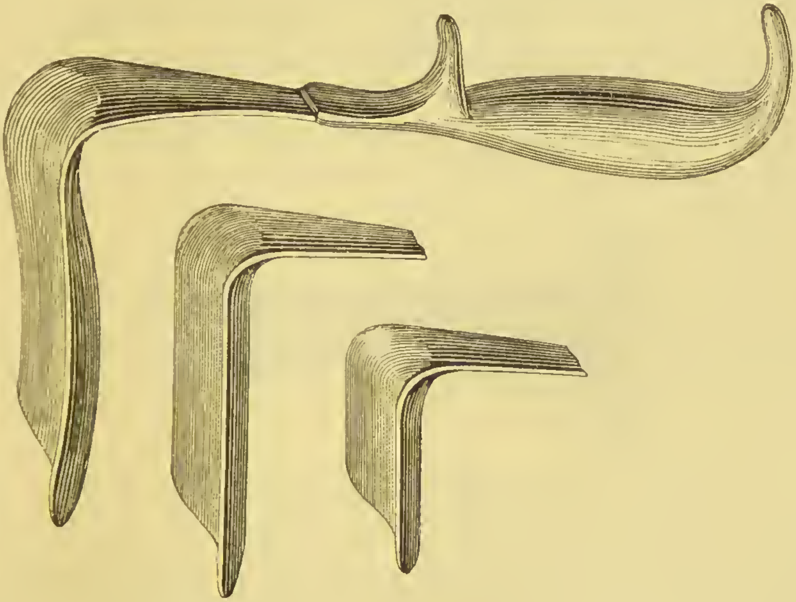

FIG. 68.
MODIFIED SIMS' SPECULUM in one piece (*Doyen*).

How used.

Mode of employment of the Fergusson speculum.—The patient lies in the left lateral position with hips raised. Warm the speculum, and oil it on the outside. Take it by the trumpet end with the right hand and pass it into the vaginal orifice previously opened up by index and middle fingers of the left; now push it in, short side to the front, until arrested. By looking along it, the practitioner can note if the cervix is in view. It is generally not so, but may be snared by the following manœuvres: carry the trumpet end well back towards the perineum, and then depress the distal end first to the left and then to the right, finally turning it round if these fail. In multiparæ with lax vagina it is easy to pass the Fergusson; but it is more difficult in nulliparæ.

Uses. The Fergusson is a favourite speculum with many. It is useless in vaginal and cervical surgery, but with it applications to the cervix can be made very well and easily. When used for making applications to the endometrium, it is advisable to pull the cervix well down with a volsella after the speculum is passed, and to use a straight sound covered with cotton wool.

3. Of *bivalve specula* there are various forms; the Neugebauer with its modification—the Crescent Speculum of Barnes; the Cusco, which is often called the Bivalve Speculum; and other varieties.

Neugebauer. The NEUGEBAUER is like a Sims' speculum divided transversely at the middle of the handle. It is also made in suitable sizes.

How used. *Mode of employment.*—Warm and oil *two* blades. Introduce one blade (the broader one) with its convexity touching the posterior vaginal wall. Then introduce the other with its convexity touching the anterior vaginal wall and so that its edges fit within the edges of the posterior vaginal wall blade. The beak of the posterior blade is thus in the posterior fornix; that of the anterior blade in the anterior fornix. From their contact a leverage is obtained on approximating the handles, by which traction is made on the fornices, and the cervical canal more or less everted.

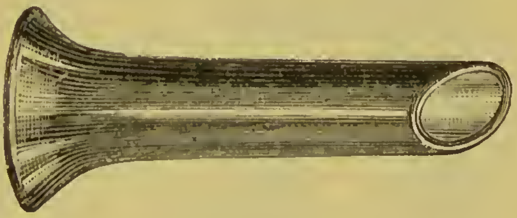

FIG. 69.

FERGUSSON SPECULUM.

The Neugebauer and Crescent specula are useful in making cervical and endometric applications, and are better specula than the Fergusson.

Cusco Speculum. The CUSCO or BIVALVE SPECULUM is shown at fig. 70. It is composed of two blades jointed on to one another at their bases. The blades are opened to the desired distance by pressure on the thumb-piece, and kept open by a screw. It is introduced with its blades right and left, and then turned so that they lie anterior and posterior, that with the screw being posterior. It is then pushed onwards, and the blades opened and fixed by the screw. Care should be taken not to catch any of the hair in the screw; and, in withdrawing it, not to pinch up the vaginal walls.

The Cusco speculum is self-retaining and useful in cervical and endometric applications.

W. L. Reid of Glasgow has introduced another variety of bivalve speculum which he has found useful. In it the blades are separable and move on parallel bars.

If the patient be placed in the genupectoral or semiprone posture, the posterior vaginal wall hooked back with the fingers and the cervix drawn down with a volsella, a useful view can be obtained without the aid of any speculum.

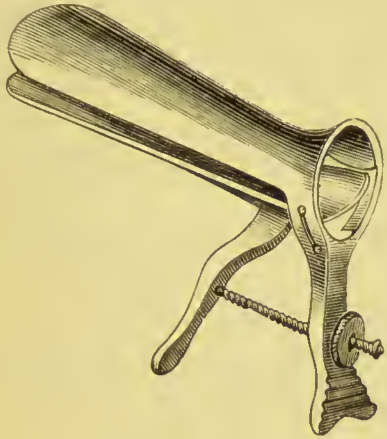

FIG. 70.
CUSCO'S SPECULUM.

USES AND COMPARATIVE VALUE OF THE VARIOUS SPECULA.

The Sims is undoubtedly the best and most scientific type of speculum we possess. When properly used and aided by the volsella or tenaculum, it leaves nothing to be desired in certain cases. The operative development of the past few years has led to the abandonment of the Sims' posture by most gynecologists, and the almost exclusive employment of the lithotomy one for operative work. The specula now mainly used are modified Sims' specula (v. fig. 68), *i.e.*, the blades are shorter and broader. They thus allow of the cervix being well drawn down, and broaden the vaginal entrance. For operative cases their use is imperative.

The Fergusson is easily passed, involves only slight exposure, and is good in very minor gynecology. It gives only a limited view of the vaginal walls. The student should note that it brings the flaps of a split cervix together and somewhat conceals the lesion.

The Neugebauer, on the other hand, opens up a cervical split, and may do this so effectually as to give the impression that there is none. The Fergusson and Cusco are *self-retaining*.

CHAPTER XI.

THE UTERINE SOUND.

LITERATURE.

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Uterine Sound.

We shall consider this important gynecological instrument as follows:—

1. Its nature;
2. Preliminaries to its use, contra-indications;
3. Method of use, difficult cases;
4. Employment for diagnosis and treatment;
5. Dangers attending its use;
6. Relation to bimanual and rectal examination.

NATURE.

Nature.

The sound of Sir James Simpson is the classical instrument. We describe it, therefore, as a type of the instrument, and then consider its modifications.

Simpson's sound is a rod of flexible metal 12 inches long, specially graduated, and provided with a suitable handle (fig. 71). It is made of copper, nickel-plated; this is sufficiently pliable to be moulded, and yet sufficiently stiff to retain any special shape given to it. Instrument-makers often make this sound too unyielding. It should be always pliable enough to be bent with two fingers.

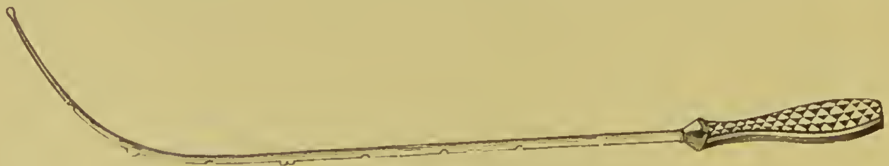

Fig. 71.

Sir J. Y. Simpson's Sound.

The handle has the shape shown at fig. 71. Note that it is roughened on the same side as that towards which the point of the instrument lies. Consequently, when the sound is in the uterus, we can tell the direction of the point by noting this roughness on the handle.

The graduation is important. 2½ inches from the point is a rounded knob: this is the length of the fully developed unimpregnated uterine cavity. Other markings are 3½ inches, 4½ inches, 5½ inches, and so on up to 8½ inches. The notch, 1½ inches from the point, is of little use and weakens the instrument.

The modifications of this instrument are numerous. The changes are chiefly in its flexibility, lightness, and in the use of another material.

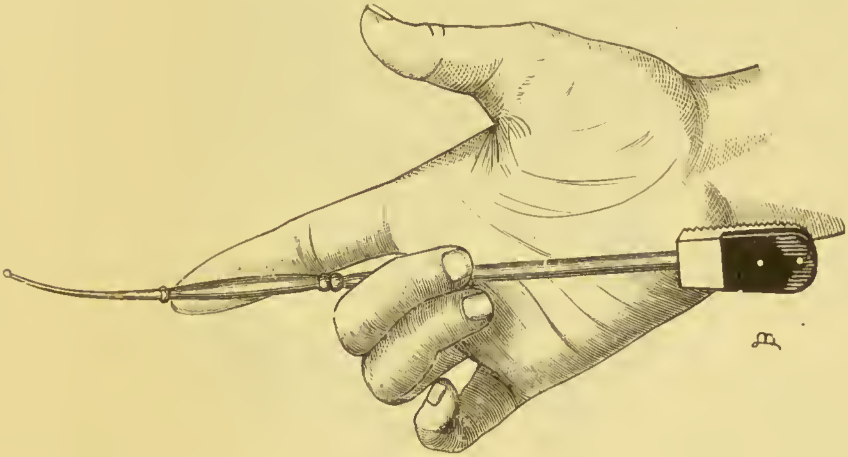

Fig. 72.

A. R. Simpson's Sound.

A. R. Simpson has modified the instrument by making it shorter, abolishing the 1½ inch notch, and squaring the handle (fig. 72): this gives a very handy and useful instrument.

PRELIMINARIES TO ITS USE: CONTRA-INDICATIONS.

Preliminaries to Use.

No instrument should have the preliminaries to its use more carefully considered. The rash and careless use of the sound may do immense mischief to the patient. Note, then, *when not to use it.*

(1) The sound is not to be passed during an ordinary menstrual period.

(2.) It is not to be passed in an acute inflammatory attack of uterus, ovaries, pelvic peritoneum, or connective tissue.

(3.) It is not to be passed in cases of cancer of the cervix or body of the uterus.

(4.) It is not to be passed if the patient has missed a menstrual period. This is a safe rule, but admits of limitation, as we shall see afterwards

Before using it, attend to the following points.

(1.) Ascertain that the patient has not missed a period.
(2.) Do the bimanual carefully. If in doubt, use the rectal examination aided by the volsella.
(3.) Place the patient in the left lateral posture.
(4.) Give the sound the curve you find the uterus to have.
(5.) Never pass the sound without preliminary disinfection of the external parts and vagina. This restricts its use in the consulting room.

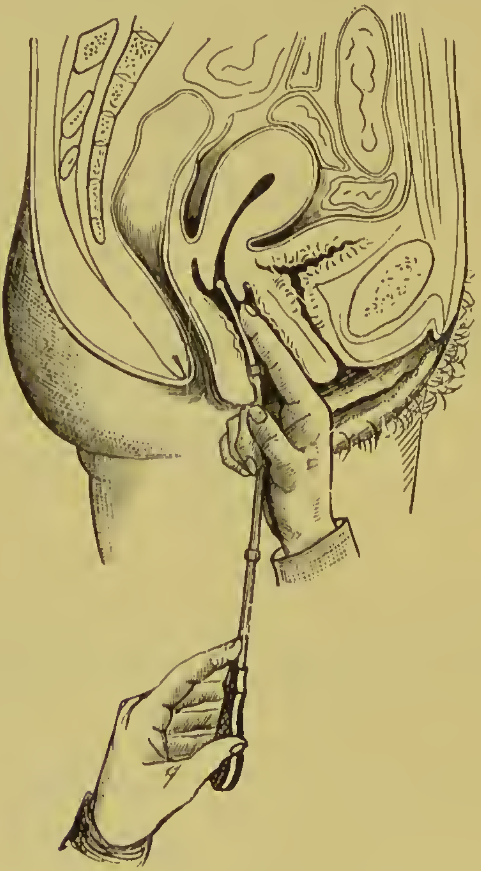

FIG. 73.

FIRST STAGE OF PASSING THE SOUND.

METHOD OF USE.

Method of Use.

After the preliminaries mentioned above, take the sound, previously disinfected, in the left hand. Pass the index finger of the right hand into the vagina and touch the anterior lip of the cervix, *i.e.*, in front of the os. Guide the sound along the vaginal finger and make the point, which is directed backwards, enter the os uteri (fig. 73). Pass it in for an inch or so, to fix it.

If the uterus be retroverted then carry the *handle* towards the symphysis, when the point of the instrument will glide into the uterine cavity until arrested by the fundus (fig. 74). No force is needed. If force seems necessary, the instrument should be withdrawn and a more careful Bimanual performed. When Uterus Retroverted.

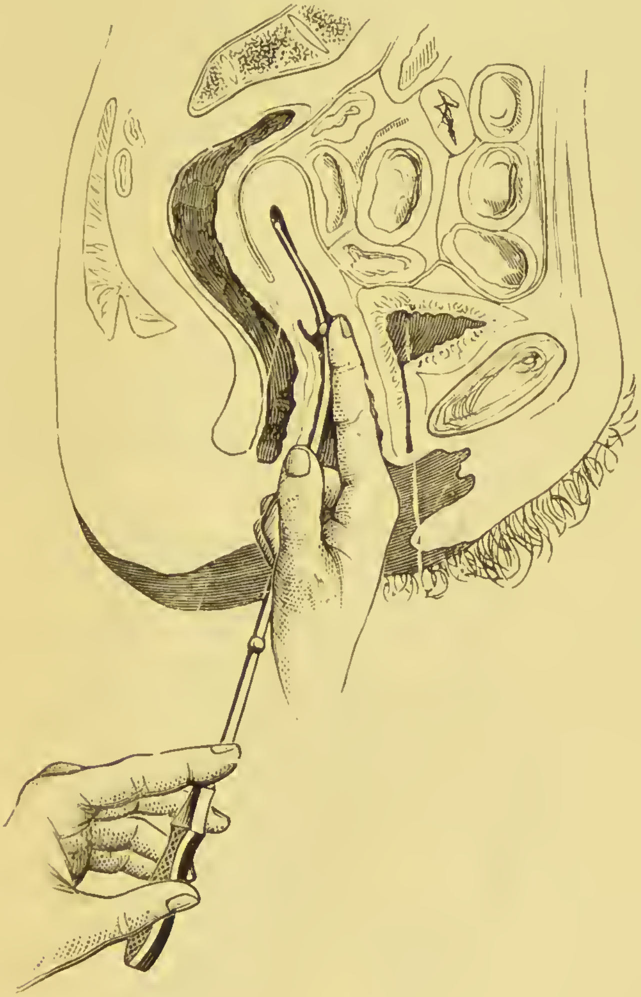

FIG. 74.
SECOND STAGE OF PASSING THE SOUND when UTERUS is Retroverted.

If the uterus lie to the front, the procedure is different. Pass the sound as already described until it has entered the cervix for an inch or so (fig. 73). Note now that the point of the sound looks back, whereas the fundus lies to the front. Clearly, we must make the point look to the front. This is done by turning the handle so that its roughened surface looks to the front. To do this we do not twist round the handle on its long axis, but make it sweep round the arc of a wide semi-circle as in fig. 75. The point, during this manœuvre, remains fixed or nearly so. When Uterus to Front.

Now carry the handle back to the perineum when the point glides into the cavity (fig. 76).

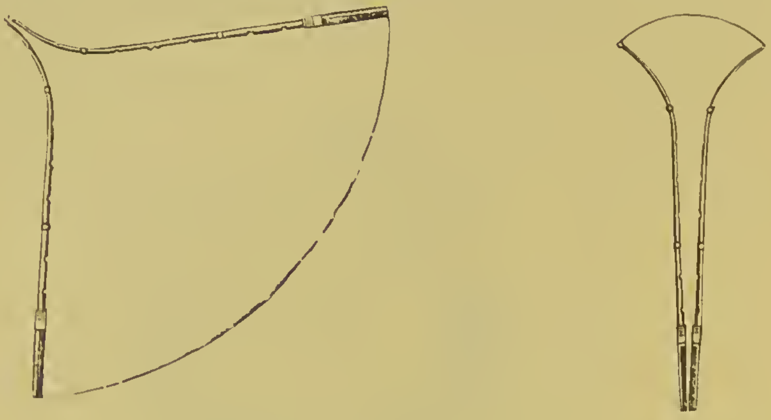

FIG. 75.

(*a.*) Proper method of TURNING THE SOUND, contrasted with improper method (*b.*).

Another way of passing the sound, when the uterus lies *to the front*, is as follows. Place the patient well across the bed. Do Bimanual and curve sound appropriately. Take the sound in the right hand. Pass two fingers of the left hand, palmar surface forward, into the vagina, and

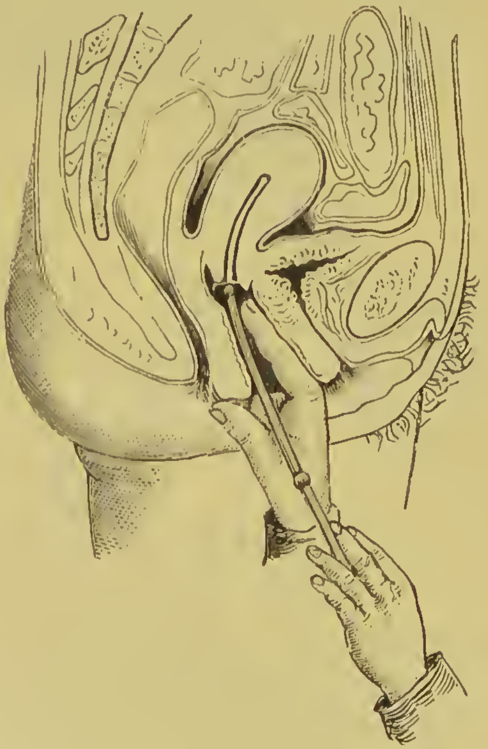

FIG. 76.

SECOND STAGE OF PASSING THE SOUND when UTERUS is to the Front.

touch the posterior lip of the cervix. Carry the sound, point looking forwards, into the vagina ; make it enter the os, and then carry the handle towards the perineum, when the point will glide on. This method avoids the sweeping round of the handle, and is useful if the uterus is very much anteverted.

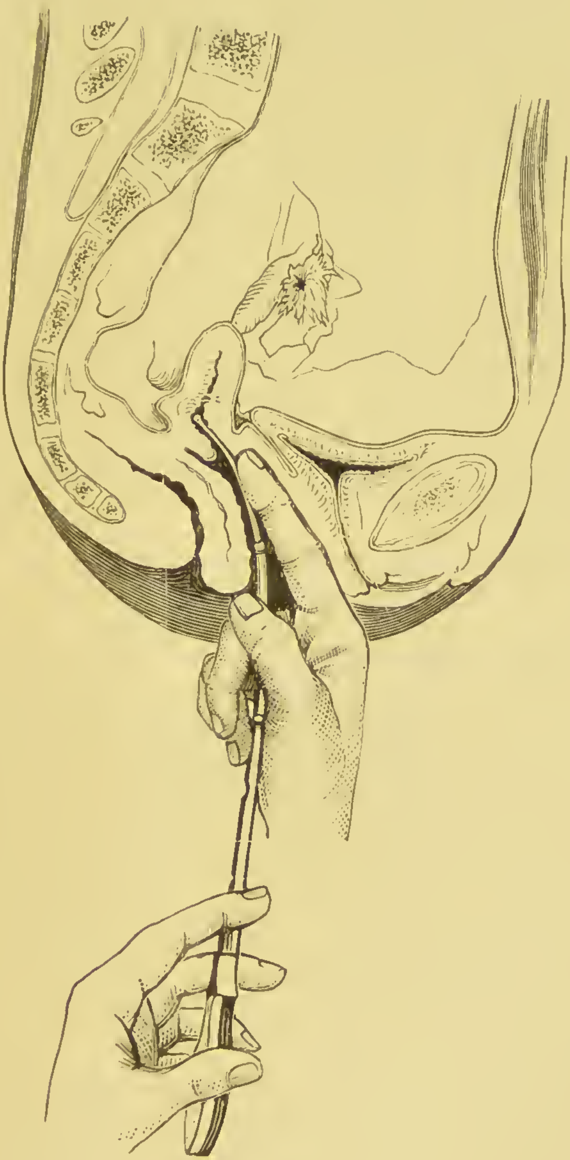

FIG. 77.

SOUND ARRESTED (before Rotation) in a case of Anteflexion.

The sound may be passed after the uterus is drawn down with a volsella, or after the Sims' speculum has been introduced.

Difficult Cases for Sound.

Difficult Cases.—These are chiefly found in markedly anteflexed uteri. The sound passes in so far (fig. 77), but when turned has its point looking too directly upwards. In such cases first draw the cervix down with a volsella, now pass the sound, and should it still stop at the flexion make pressure with a finger in the anterior fornix to push up the fundus. Then get an assistant to carry the handle of the sound towards the perineum.

EMPLOYMENT OF THE SOUND FOR DIAGNOSIS AND TREATMENT.

(*A*) DIAGNOSIS.

Use of Sound in Diagnosis.

(1.) *Length of uterine* cavity. This varies in different pathological conditions. Thus the cavity is

(*a*) Lessened in Superinvolution of uterus,
Atrophic uteri;

N.B.—The sound easily perforates the thin wall of the superinvoluted uterus; this *may* do no harm. It may also pass along the Fallopian tube.

(*b*) Increased in Subinvolution of uterus,
Hypertrophy of uterus,
Cervical hypertrophy,
Endometritis,
Submucous fibroids,
Interstitial fibroids,
Small uterine polypi,
Prolapsus uteri.

(2.) *Direction of uterine axis;* whether retroverted, anteverted, lateriverted.

(3.) *Relation of axis of uterine body to that of cervix;* whether we have anteflexion or retroflexion.

(4.) *Stenosis and atresia at os internum and os externum; tenderness of fundus*, as in endometritis.

(5.) *Mobility of uterus.* This should be ascertained in the following way. Pass the sound as already described. Make the patient turn on her back, and then place two fingers in the vagina, palmar surface upwards and touching the posterior lip of the cervix. The sound lies on the palm of the hand, is steadied with the thumb, and can be used to move the uterus gently about as desired.

(6) *Rough condition of endometrium;* often associated with bleeding when sound is passed.

(7.) *Differential diagnosis between uterine polypi projecting into vagina, and inverted uterus, etc.*—When we have a polypus to deal with, the sound passes in through the cervix for more than the usual distance because the uterine cavity is enlarged. In inversion, it passes for only a short distance into the cervix and is then stopped by its reflexion. Sometimes, however, the neck of the polypus is adherent all round to the cervical canal, thus simulating inversion: and in some very rare cases the mucous membrane of the uterus becomes separated and expelled from the uterine cavity, simulating inversion of the whole uterus owing to the separation stopping at the os internum. It is evident that in these last two cases the bimanual clears up the diagnosis, the upper hand feeling the body of the uterus in its normal position in both of them. The sound is only confirmatory of the bimanual.

(*B*) TREATMENT.

Use of Sound in Treatment.

(1.) *Rectification of abnormal angular relation between the uterine body and cervix* (anteflexion, retroflexion); *dilatation of uterine canal as a whole, or of stricture at os internum.*

(2.) *Replacing of retroverted unfixed uterus.*

(3.) *Applications of medicaments to endometrium made on the sound covered with cotton wool.*

DANGERS ATTENDING ITS USE.

Dangers of Sound.

The risks to the patient from the passage of the uterine sound are abortion, and abrasion of the uterine mucosa with absorption of septic matter and resulting pelvic cellulitis or peritonitis.

The former untoward result must be very carefully guarded against. One valuable caution is never to omit the question as to the menstruation, and to ask if it was the usual amount, as some women have a slight discharge of blood at the first period after they conceive. The best safeguard is the careful performance of the bimanual. This soon teaches the practitioner to know whether he has an unimpregnated uterus between his hands, or one at the second or third month of gestation. Special care should be taken when the uterus is retroverted: it may be also gravid; and the pregnancy may, by causing pressure, have induced the patient to consult a medical man. As the bimanual is often difficult, an unwary use of the sound may make the diagnosis disagreeably evident.

The means to avoid setting up any inflammatory disturbance are—to perform the bimanual carefully, to curve and oil the sound properly, and to pass it gently and with antiseptic precautions.

SOUND COMBINED WITH BIMANUAL.

Use of Sound in Bimanual.

The importance of this method of examination has been pointed out by A. R. Simpson. For its performance the short sound with the square handle (fig. 72) is necessary. It is of such a length that, when the middle finger is at the knob, the flat surface of the handle rests on the ball of the little finger, against which it is steadied by the flexed little and ring fingers.

The sound is introduced into the uterus in the ordinary way. The fingers are passed into the vagina as for a vaginal examination, and the sound grasped as in fig. 72. Or the sound may be steadied with the middle finger while the index is used to feel the uterus through the anterior fornix (fig. 78). The external hand is placed as in the bimanual.

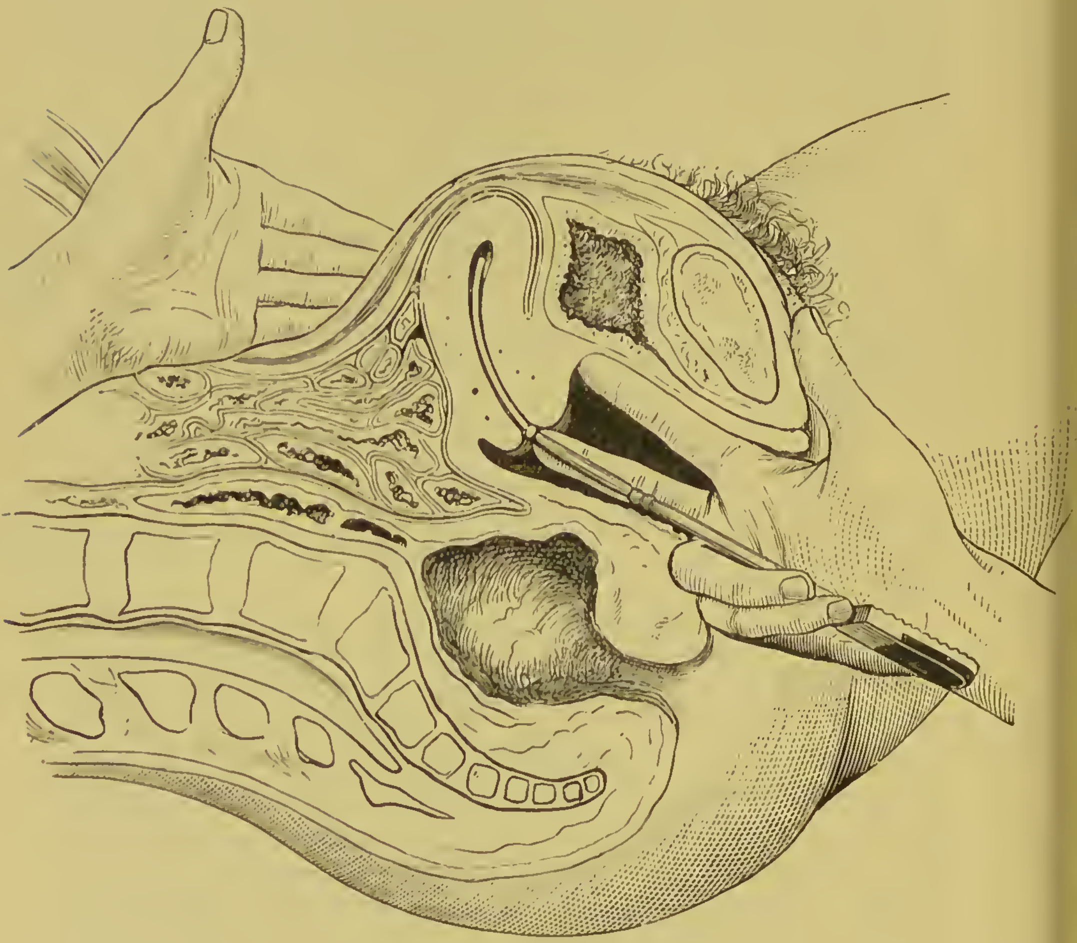

FIG. 78.

SOUND combined with BIMANUAL Examination (*A. R. Simpson*).

This method is specially useful (*a*) when the uterus is flaccid; the sound stiffens it, and enables the external hand to define it: (*b*) when, from the presence of small fibroids or pelvic deposits, there is doubt as to what is the fundus uteri; the sound felt by the external hand in the uterus indicates the fundus.

RELATION OF SOUND TO BIMANUAL AND RECTAL EXAMINATION.

Relation of Sound to Bimanual and Rectal Examination.

Before Sir James Simpson introduced the use of the sound, gynecological examination was confined to the exploration of the vagina and cervix.

Simpson gave an immense impulse to gynecology by placing in the hands of gynecologists an instrument which enabled them to explore the uterine cavity above the cervix, and so to obtain a perfection of diagnosis before undreamed of; thus gynecological examination came to consist of vaginal examination, and then the use of the sound. He recommended, further, the elevation of the uterus with the sound, and its definition with the upper hand.

The next step in gynecology was the use of the two hands—the bimanual and rectal examination—which in the last forty years has developed immensely. Consequently the use of the sound has become more limited. The teaching in this chapter has been based on a recognition of this fact, and the use of the sound is recommended only in cases where after bimanual and rectal examination has been carefully employed, the necessary information is not obtained. Even then the sound should not be passed in the consulting room unless suitable precautions can be used. In curetting, it is advantageous to pass the sound after all antiseptic precautions have been used, and the uterus has been drawn down, so that the direction of the cavity may be ascertained exactly. The drawing down of the uterus has changed its axis, and the preliminary passage of the sound gives the operator accuracy in passing the dilator and curette.

In certain cases of fibroids, or in inflammatory conditions where the organs are matted, the careful use of the sound is of great value in diagnosis.

CHAPTER XII.

TENTS AND OTHER UTERINE DILATORS.

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Uterine Dilators.

HITHERTO we have considered only the means which have placed the vagina and cervix within range of digital examination. In this section we take up the methods by which we get digital examination of the uterine cavity—methods of the highest practical value, which, like the sound, we owe to the genius of Sir James Simpson.

We therefore consider the following methods of dilating the cervical canal:—

I. *Slow dilatation with sponge tents, tangle tents, tupelo tents;*
II. *Rapid dilatation with graduated hard-rubber and metal dilators;*
III. *Dilatation by incision and screw dilators* (*v.* also Chap. XXVI.).

DILATATION BY SPONGE, TANGLE, AND TUPELO TENTS.

Sponge Tent—material.

1. *Material.*—The sponge tent is a cone of good, unbroken, thoroughly dried sponge, impregnated with some antiseptic, and then firmly compressed into small transverse bulk, its original length being preserved. When thus prepared and placed under conditions where it can absorb moisture, it swells up; and in thus expanding dilates any dilatable structure which may grasp it.

Good sponge tents of various sizes may be had from all chemists. In order to prevent the antiseptic from volatilizing, the sponge tents are covered with grease. They are provided with a tape at the base to aid their extraction from the cervix after use.

Tents are also made from the ordinary sea-tangle (laminaria digitata) (fig. 79), and from tupelo wood (nyssa aquatilis). It is certainly the case that the tupelo expands more rapidly than either tangle or sponge. Fig. 80 shows its power in this respect. Tangle tents may be had hollow; this facilitates the imbibition of moisture but weakens their expanding power.

2. *Purposes for which used.*

Uses of Tents.

(1.) To restrain hæmorrhage in cases of abortion, and at the same time dilate the cervix for further interference.

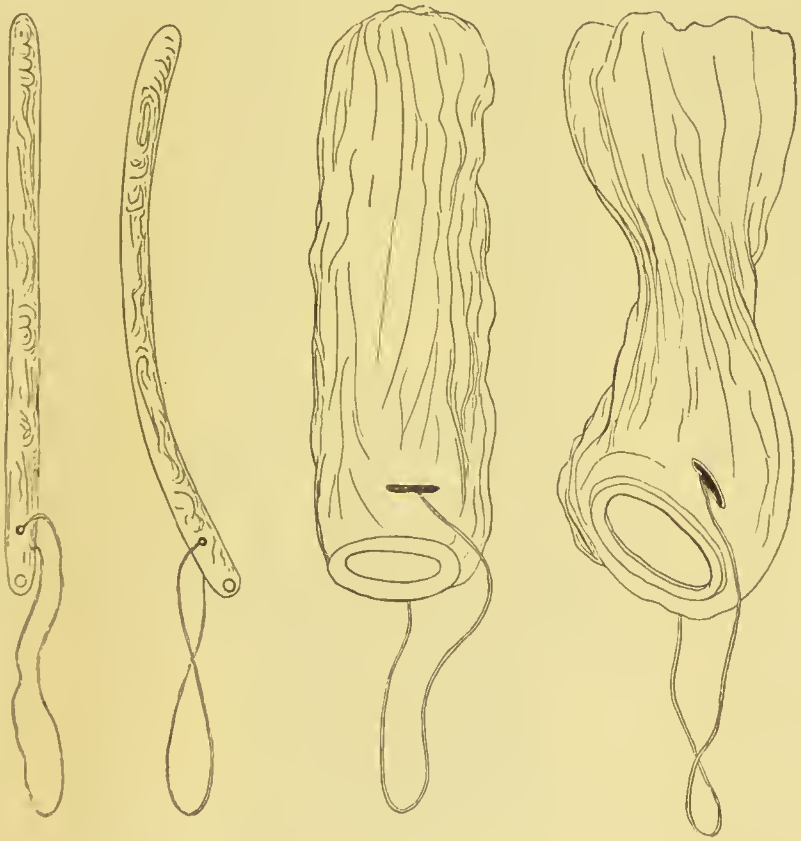

Fig. 79.

Shows on the left a straight and a curved tangle tent, and on the right these tents after expansion. Note how one has been gripped by the os internum (*Mundé*).

(2.) To dilate the cervix and uterine cavity, and enable the practitioner to ascertain and remove the cause of pathological uterine hæmorrhage, whether due to endometritis, sarcomata, polypi, or incomplete abortion.

(3.) To correct pathological flexions of the uterus, or to dilate a stenosed cervix. Their use for this is not only unnecessary but dangerous.

Scope of Tangle and Tupelo Tents.

Tangle tents have the same scope as sponge tents. They do not, however, expand so well and thoroughly. Their special advantages are due to their smaller size, and the fact that several may be passed at the same time into the cervix. They may be used, therefore, in cases of narrow cervix and in flexions, but we do not advise them for this purpose, rapid dilatation or Dudley's operation being better. Tupelo tents are very good; they are easily passed and, from their rapid expansion, preferable to sponge tents.

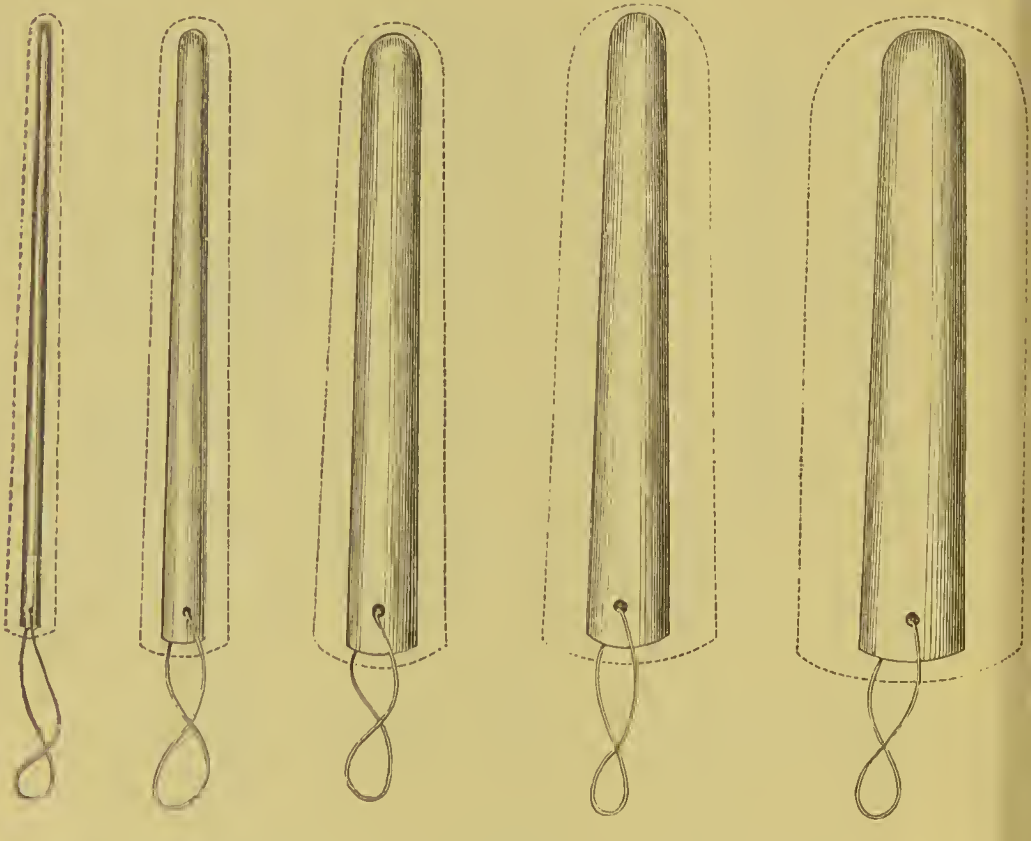

FIG. 80.

DIAGRAM to show relations between size of Tupelo Tent, before and after expansion. The dotted outside line indicates the size of the tent after expansion (*Mundé*).

Preliminaries and Mode of Use.

Disinfection of Tangle and Tupelo Tents.—Tangle tents may be dipped in pure carbolic acid and then washed in sterilised water prior to insertion. Tupelo tents can be placed in a solution of iodoform and absolute ether (3 per cent.) for twenty-four hours prior to use. Practically only tupelo tents are now employed.

3. *Preliminaries to and Method of Use.*—Tents should not be passed during an ordinary menstrual period, although they often require to be used when pathological bleeding is going on. They should always be passed at the patient's own house; and she should be kept strictly in

bed during their use, and for some time after. Before their use the vagina should be thoroughly washed out with warm carbolic lotion (1–40), or with corrosive sublimate (1–2000).

Tents may be introduced in various ways.

How passed.

(1.) The patient is placed in the genufacial, or better, in the semi-prone posture. Sims' speculum is passed, the anterior lip of the cervix laid hold of with a volsella and drawn down. The tent, held in forceps, can then be passed into the cervix (fig. 83). The usual precautions as to cleansing the hands and vagina are taken.

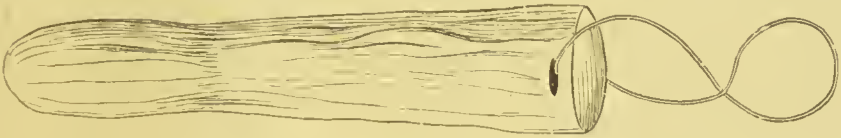

FIG. 81.

EXPANDED TUPELO TENT with constriction at os internum (*Mundé*).

(2.) The tent is fixed on the spike of an appropriate instrument, and is then passed like the uterine sound—*i.e.*, with the patient placed in the left lateral position, the index and middle fingers carried into the vagina and placed on the anterior lip of the cervix. The tent, fixed on the spike, is passed along these fingers and its point made to enter the cervix. The handle is then rotated and carried to the perineum.

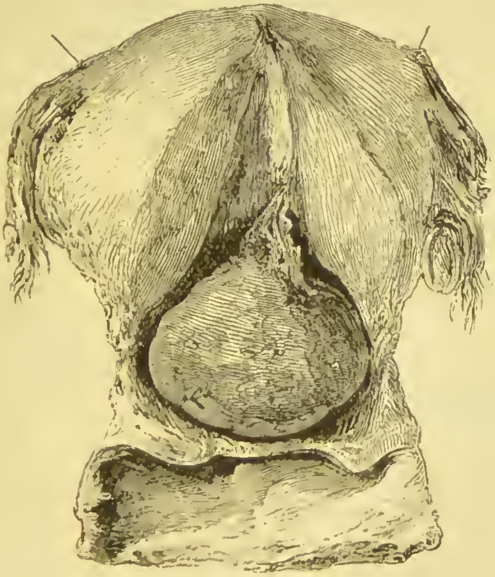

FIG. 82.

SPONGE TENT POLYPUS OF SIR JAMES SIMPSON. (½)

Drawing of the uterus which contained a polypus—obtained from a patient of Sir James Simpson's, who died from the hæmorrhage it caused. It was this preparation which suggested to him the sponge tent.

(3.) The patient is placed on her left side and athwart the bed. Pass the volsella, draw the anterior lip of the cervix down. The volsella is not always needed. Place the tent between the index and middle fingers of the left hand with the thumb at the base, carry these fingers into the vagina with their dorsum on the posterior vaginal wall, make the point of the tent enter the cervix and push it on with the thumb.

Another way is to use the volsella as above described, but to fasten it to the bed. Then pass Sims' speculum, holding it with the left hand, so that the tent held in the right hand can be passed into the cervix without difficulty.

Occasionally difficulty is experienced in passing a tent owing to marked anteversion of the uterus. If the cervix be drawn down with a volsella, the difficulty may be overcome; or it may be necessary to partially retrovert the uterus bimanually prior to passing the tent.

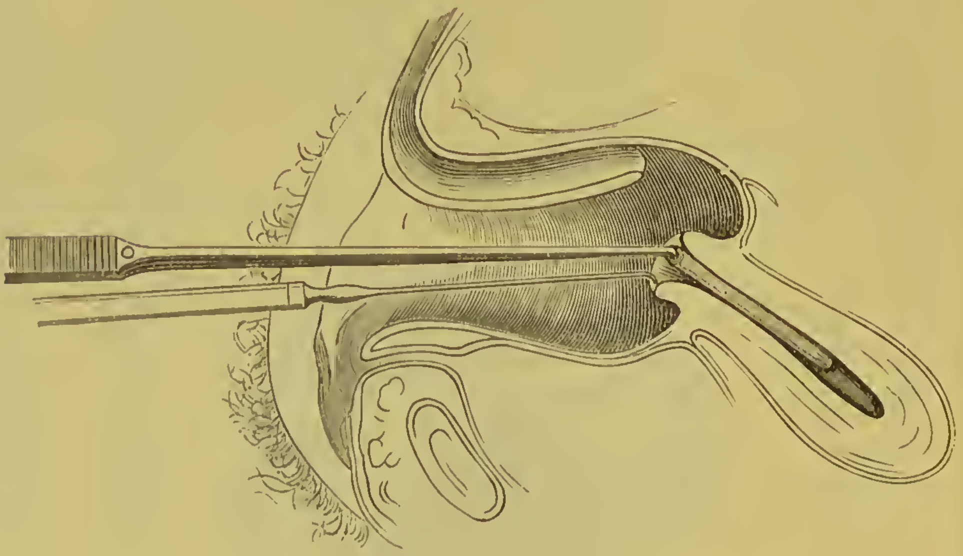

Fig. 83.

Sims' Diagram illustrating Passage of Tangle Tent. Patient is semiprone, Sims' speculum passed, and cervix steadied with tenaculum. The tent is passed with forceps.

Tents require to be left in the cervix for a period varying from twelve to twenty-four hours, an iodoform tampon being placed in the vagina. At the end of this period the tent should be removed. During the removal no great force should be used. Sometimes the removal is difficult owing to constriction by the os internum or to irregularities in the mucous membrane.

The cervix is generally then sufficiently dilated to admit of digital examination of the endometrium. If not, the necessary dilatation may be obtained by the use of metal dilators.

Dangers and Contra-indications.

Dangers of sponge and tangle tents and contra-indications. The practitioner must keep prominently before him that the use of a tent may prove by no means a harmless measure. Cases of death from septicæmia after the careful and proper use of *one* tent have occurred. The patient runs a risk proportionate to the number used; and, therefore, it is not advisable to use more than two consecutively unless under special circumstances. They are not to be used if acute or sub-acute pelvic inflammation, pyosalpinx, ovaritis (acute or chronic), carcinoma cervicis, or pelvic hæmatocele be present.

To sum up briefly, tents are highly useful in necessary cases—no means at the disposal of the gynecologist gives him in proper cases such valuable help; but he should not forget the risks occasionally arising from their use—risks which should make him cautious but not timid.

RAPID DILATATION BY GRADUATED HARD RUBBER AND METAL DILATORS.

Metal and Rubber Dilators.

The statement already made as to the dangers attending the use of slowly expanding tents would lead one to expect that attempts at rapid dilatation have been made. For this purpose, graduated vulcanite and metal dilators have been employed.

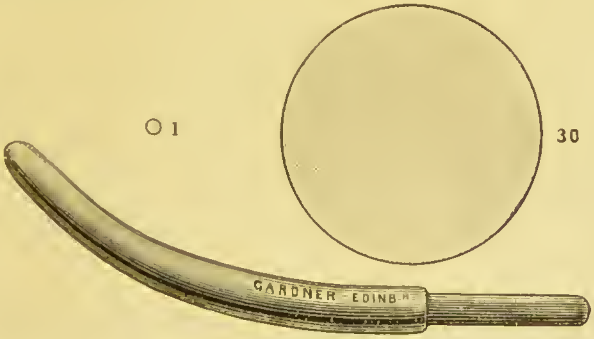

FIG. 84.

HEGAR'S DILATOR. The lower figure represents the dilator (No. 15) complete, reduced to one-third scale; the two upper figures show cross sections of the smallest (No. 1) and the largest (No. 30) sizes.

Hegar's dilators consist of a series of slightly curved stems $4\frac{3}{4}$ in. to $5\frac{1}{2}$ in. (12-14 cm.) in length, with a short flat handle 2 in. long, numbered from 1 to 30, and with diameters ranging from about $\frac{1}{12}$ in. to $1\frac{1}{12}$ in. (2-30 mm.).

Similar dilators are now also made in metal, and curved like the sound. They can thus be boiled in soda prior to use (fig. 85).

Various dilators with expanding blades have been devised. Schultze's is shown at fig. 86, and Marion Sims' at fig. 87. Ellinger's is on the same principle, but constructed so that the blades keep parallel as they expand. These may be used to complete the dilatation begun by tent or graduated dilators.

There is little doubt that, to prevent sepsis, vulcanite or metal dilators are the best. For dilating the cervical canal quickly in order to explore the uterine cavity with the finger, for the removal of polypi, or for curetting, they are specially indicated, and are to be used as follows. In a case, for instance, where the cervical canal is to be dilated in order to gain access for the removal of a polypus, the patient is chloroformed, placed in the lithotomy posture, and the vaginal douche employed. Metal dilators, which have been sterilised by boiling and lie in sterilised water, are then passed, until sufficient dilatation is obtained. The polypus is then removed, and the uterine cavity carefully douched.

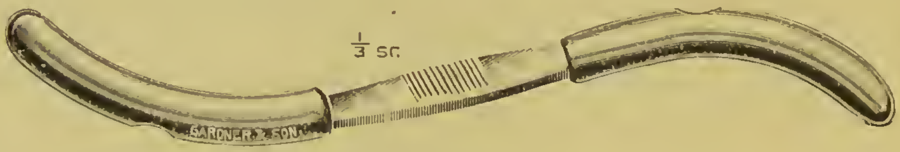

FIG. 85.

METAL DILATOR. The two ends are of different diameters. Each set contains a series of these instruments, varying in diameter.

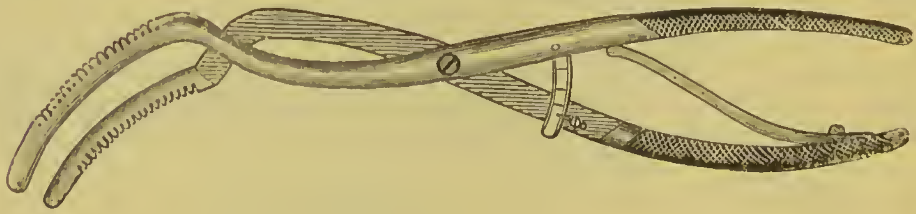

FIG. 86.

SCHULTZE'S DILATOR.

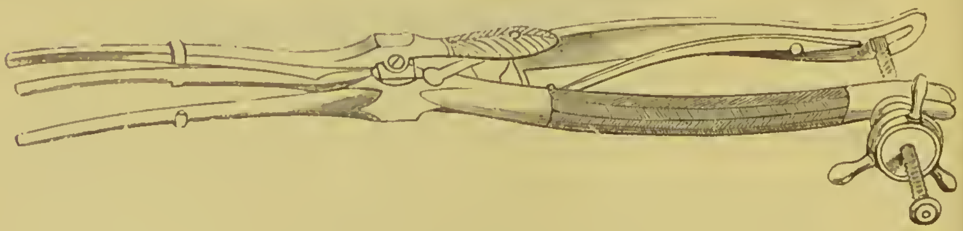

FIG. 87.

MARION SIMS' DILATOR (*Sims*).

It is probably best, however, to pass a tupelo tent twenty-four hours previous to this dilatation, as, with the use of the dilators alone, a dilatation sufficient to admit the finger may not be obtained.

We recommend, therefore, the use of the tupelo tents in cases of threatened abortion where the practitioner has not sufficient assistance to enable him to use the metal dilators, and for cases where the finger has to be introduced into the uterine cavity. Where, however, this assistance can be procured, especially for exploration, curetting, and endometric applications, metal dilators are the safest and best.

CHAPTER XIII.

THE CURETTE.

LITERATURE.

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Curette. THE curette is an instrument, provided with a cutting or a dull edge, which can be introduced into the uterine cavity (previously dilated if necessary) for the purpose of scraping off or removing abnormal endometric granulations, sarcoma of the mucous membrane, carcinoma of the cervix, or the remains of an incomplete abortion. This instrument has had a somewhat chequered career. Originally introduced by Recamier, whose instrument was stiff and sharp, it did good work in some cases; but fell into disrepute, undoubtedly deserved, after the record of certain instances where its use had caused perforation of the uterus. Marion Sims and Simon recommended a modified instrument which, owing to its stiff unyielding nature, did not at first find much favour with the profession. Thomas then introduced his flexible dull wire curette, but this has now been found too feeble, and a return has been made to stronger instruments.

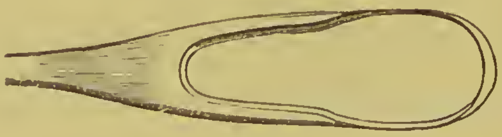

FIG. 88.

LOOP CURETTE. (1/1)

There are four varieties of curette—(1) Loop with sharp edge (fig. 88); (2) Simon's Spoon (fig. 89); (3) Roux's (fig. 90); (4) Flushing curettes, *i.e.*, with hollow stem to allow of a flow of fluid during the operations. Of these we recommend Roux's.

Uses of Curette.

Cases in which the Curette is useful.—The curette may be used to remove a piece of intrauterine tissue for aid in diagnosis. It is most frequently employed to remove abnormal tissue, in abortion, sarcomatous or carcinomatous diffuse growth, and endometric conditions.

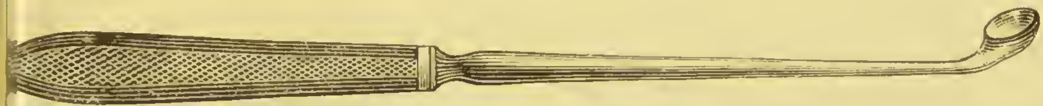

Fig. 89.

Simon's Spoon ($\frac{2}{3}$).

Simon's Spoon.

Method of Use.—We take curetting for incomplete abortion as a type of procedure. The instruments necessary are Sims' speculum, volsella, dilators, sounds or probes armed with cotton wool, and Fritsch's uterine double catheter (fig. 95). The instruments are sterilised and placed in sterilised water. The patient is placed semiprone, or, if chloroform is given, in the lithotomy posture: the speculum is passed and the cervix steadied with a volsella. Dilators are now introduced until the cervical canal is patulous enough to admit the curette easily. The curette is then employed by being passed systematically over the anterior and posterior surfaces from above downwards, and the mucous membrane down to the musculature removed. No force is required, and the finger can make out by the feeling of the curette when the resistant muscle is reached.

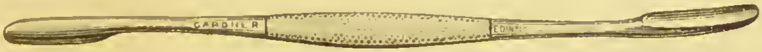

Fig. 90.

Recamier-Roux Curette.

Roux's Curette.

In cases of incomplete abortion, it is of importance to dilate sufficiently to enable the finger to be passed in. If not, detached and somewhat large pieces of the deciduæ may be retained.

The cavity of the uterus is then washed out with an antiseptic lotion, and pure carbolic acid applied on a sound armed with absorbent cotton-wool. Some gynecologists omit the washing out and carbolic application, trusting entirely to the other precautions employed (v. also chapter on Treatment of Endometritis).

We shall in the Appendix in the Classification of Diseases of Women describe a class of case under the term of chronic-infected cases, where we have multiple minor non-suppurative lesions, often depending on previous abortion, and where endometritis is a prominent condition. In such, curetting is very valuable. This point will, however, be discussed again afterwards.

In endometritic conditions, curetting is invaluable, and should to a large extent, supersede all minor intra-uterine medication. The practitioner will find curetting in suitable cases one of the most satisfactory operations in gynecology.

Cautions and Dangers.

Cautions and dangers.—All antiseptic precautions must be used. The dangers are *nil* when the operation is properly performed, but the uterus has been perforated in a good many cases. When recognised, abdominal section may be necessary, and the perforation stitched or the uterus removed, as may be required. In some cases the omentum has been drawn down into the uterus and vagina.

RELATION OF POSTURE TO EXAMINATION AND TREATMENT.

We have already mentioned several postures as being the proper ones for certain manipulations; and we here sum up briefly what it is of use to know in regard to these.

The *lateral posture*, where the patient lies on her side in the ordinary way, is convenient for vaginal examination; for the use of Fergusson's, Neugebauer's, or Cusco's speculum, and the passage of the sound and catheter.

The *dorsal posture* is imperative for abdominal examination and the bimanual.

The *semiprone* is the best posture for passage of Sims' speculum.

The *lithotomy posture* is specially valuable for operations on the perineum, vaginal walls, cervix, and uterus.

The *genupectoral posture* is used in replacement of the retroverted gravid uterus and for examination of the bladder.

The *Trendelenburg posture* will be alluded to in the description of abdominal operations.

CHAPTER XIV.

KNIVES; SCISSORS; NEEDLES; SUTURES; DOUCHES AND SYRINGES; CAUTERY.

KNIVES.

Knives.

For vaginal and cervical surgery, long-handled knives with the blade straight or at an angle to the shaft are required (*v.* under operation for vesico-vaginal fistula), but the main use of the knife to the gynecologist is in abdominal section. The handle should be made of metal so as to allow of thorough cleansing.

SCISSORS.

Scissors.

These are of the greatest use to the gynecologist and have superseded the knife in all perineal operations. Curved scissors are necessary for fistula cases (fig. 91), Bozeman's being specially good. They are right and left, but no woodcut gives a proper idea of their curves. For cervical operations, stout and sharp scissors are necessary as the vaginal portion of the cervix is tough. In perineal operations a pair of short angled scissors is best. For Hysterectomy, probe pointed scissors are very useful, but sharp pointed ones, with locking blades, are also employed.

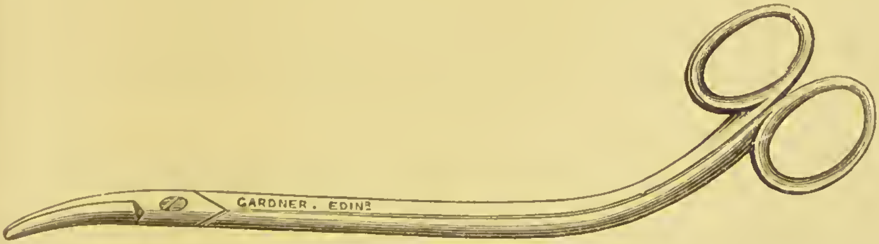

Fig. 91.
Simple Curved Scissors.

NEEDLES.

Needles.

We need only note that for cervical and fistula operations strong short needles either curved or perfectly straight are needed. The cervical tissue is so dense that markedly curved needles snap when slight. They are passed with a needle-holder of which fig. 92 shows a simple form. Curved or tubular needles set on handles are also useful.

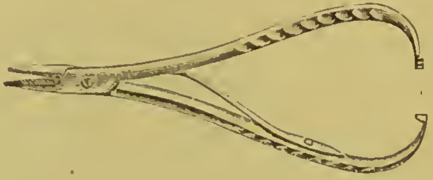

Fig. 92.
Needle-Holder.

Needle Holders.

Hagedorn's needles are flattened laterally and full curved. A special needle-holder is necessary for them. For perineal operations strong full-curved needles are necessary.

SUTURES.

These may be silver wire, silk, catgut, silk-worm gut, or horse-hair. *Catgut* has of late years come into special prominence in gynecology; some use it entirely in abdominal operations. The great question is how to prepare it so that we may insure its being aseptic and holding for ten days to three weeks. This is discussed in Chapter XV., but the methods of operators vary exceedingly. Catgut is employed in perineal operations, except for the skin stitches, where silk-worm gut or silver may be used. It is also the usual ligature for bloodvessels. It may be employed entirely in any operation.

Silk-worm gut is often used in fistula cases, not buried however, and in skin sutures.

Silk is usually employed for the ovarian pedicle, and may be used for the abdominal wound, either through and through, or as a buried suture to unite the fasciæ. Fuller details are given under the special operations.

VAGINAL SYRINGES AND DOUCHES: UTERINE DOUCHE.

For the purpose of applying antiseptic and astringent lotions to the vagina and split cervix, for hot-water injections, and for merely cleansing purposes, the vaginal syringe and douche are employed.

Vaginal Syringe.

Vaginal Syringes.—The best known is the Higginson syringe. Valuable as this is, it is difficult for ordinary patients to manage single-handed. For them we should recommend the

Vaginal Douche.

Vaginal Douche.—A convenient form of this is shown at fig. 93. It can be hung up after being filled, and a gentle flow is thus obtained by gravitation. The overflow from the vagina is received into any suitable receptacle on which the patient sits.

For patients in bed its use is equally easy. The nurse or attendant should be instructed to make the patient lie on her back, her hips being well raised with a pillow. The pillow itself should be covered with a waterproof or folded blanket. A bidette or an ordinary basin is then slipped below the hips to receive the overflow.

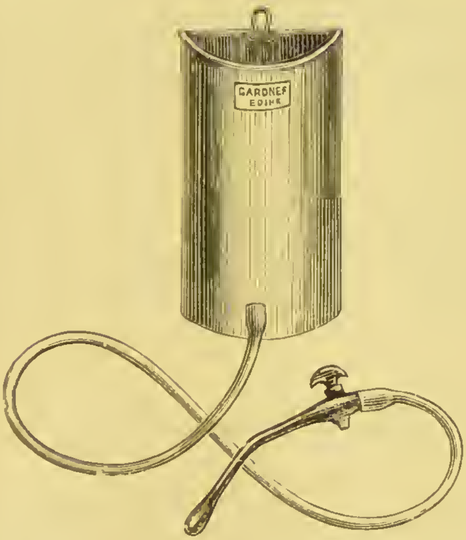

Fig. 93.

Vaginal Douche.

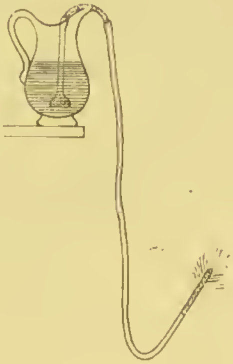

Fig. 94.

Syphon Douche.

Instead of the douche, a single tube working by syphon action may be employed (fig. 94). This consists of a "sinker," a long piece of gutta percha tubing with a bent piece of glass tubing inserted so as to render it rigid where it passes over the edge of the vessel containing the fluid, and a terminal vaginal tube. The "sinker" should be large and hollow, so that when inverted it may serve as a cup by which the tube may be filled with water; once filled, the tube is temporarily compressed while the sinker is being dropped into the jug or pail full of water ready for use. The great advantage of the douche is its simplicity.

Medicated Injections.

The material for injection is various. Hot water at a temperature of 110°-120° F. is invaluable in inflammatory conditions.

Hot carbolic lotion (equal parts of hot water and 1–20 lotion so as to give a temperature of 110°-120° F.) is admirable for cleansing purposes in abortion cases.

In so-called leucorrhœal conditions, the discharge is not vaginal as a rule, except in old women, but comes from the uterus. In such the vaginal douche merely cleanses the vagina without diminishing the discharge. Boracic acid is an excellent mild antiseptic in the proportion of ʒi to the pint. The crystals should be used, not the fine powder. Alum, sulphate of copper, or sulphate of zinc (ʒss. to Ojj.) may be substituted for boracic acid, if a local astringent action is thought necessary.

It is a good plan to make the patient first douche with hot water in the dorsal posture, with a slipper bed pan or bed bath below the hips, and end with the special lotion. After it is finished the dorsal posture should be maintained for ten minutes, and the last of the injection expelled by sitting up.

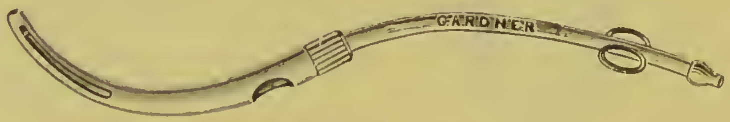

Fig. 95.

Fritsch's Catheter for Washing out the Interior of the Uterus.

Uterine Douche.

The *Uterine Douche* is to be employed only after the cervical canal and uterine cavity have been so far dilated as to admit the tube easily. An ordinary vaginal douche or Higginson syringe may be employed, the Fritsch catheter being attached to the nozzle of the latter by a long piece of india-rubber tubing. In giving a uterine douche in the removal of abortion or fibroid polypus, the external genitals should be cleansed with soap and carbolic lotion, the hair shaved if necessary, and the vagina thoroughly douched. Care must be taken to give the uterine douche gently and slowly, allowing free exit of the fluid, and carefully excluding air from the apparatus. The size of the uterine tube should never be such as to fill the cervical canal, and the douche should be held not much above the level of the patient's hips. The best uterine tube is Fritsch's (fig. 95), or some of its modifications, as the double canula entirely obviates any retention of fluid. Passage of the fluid through a patent Fallopian tube into the peritoneal cavity is one of the risks, but can always be avoided by giving the injection gently.

The uterine douche is used once only, immediately after the operation, unless septic symptoms arise. In the after treatment, the vaginal douche is sufficient.

CAUTERY.

Cautery—Paquelin's.

The ordinary cautery used to be employed in the treatment of the pedicle in ovariotomy.

In the well-known Paquelin's cautery, the vapour of benzoline is pumped through a slender, hollow cone of platinum, which has been previously heated in a gas flame or spirit lamp. It speedily becomes red or white hot by the combustion of the vapour, and can then be used.

Note as to its use: (1) To be careful with the benzoline as it is exceedingly inflammable; (2) To heat the platinum cone first (in outermost zone of the flame) before pumping in the benzoline. If the vapour is pumped in before the platinum is hot enough to ignite it, the cone is cooled by its cold stream.

The cautery should be used at a dull heat. When white hot it causes bleeding, because it thoroughly burns the tissues and thus leaves no char to act as a hæmostatic.

When used to cauterize the cervix, care is necessary that the hot metal rod does not touch the vaginal walls. Various plans have been tried to prevent this accident. Thus the rod may be covered except at its terminal two inches with a wooden case which must not touch the metal.

CHAPTER XV.

ANTISEPSIS: ASEPSIS.

LITERATURE.

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ANTISEPSIS.

Anti-septics.

By an antiseptic, we understand, strictly speaking, an agent capable of destroying or inhibiting the growth, or neutralising the products of micro-organisms causing sepsis, such as the micrococci known as streptococcus pyogenes, and staphylococcus pyogenes aureus. Antiseptics of course can also destroy any form of micro-organism, and the term is thus used in this more extended sense.

Lister's standpoint was that septic infection of wounds was due to the introduction of "germs" from the wound-surroundings, *viz.*, from the air, the instruments used in operating, and the hands of the operator. The spray of carbolic lotion (1–40) was used to render the air pure; and for instruments and hands, carbolic lotion (1–40 and 1–20) was employed. Lister's main ideas have in all respects been confirmed, except that air infection was exaggerated and the difficulties of disinfecting skin surfaces underrated. The present standpoint is that wound infection is due to micro-organisms introduced to an inappreciable extent from the air, but mainly by unclean touch from hands, instruments, and the area operated on, and that these require a more thorough cleansing than was at first believed.

Formerly the antiseptic properties of any substance were considered sufficient if it kept a wound free from fœtor and caused no blackening of the green silk protective placed over the wound. Owing, however, to increased knowledge as to the nature of micro-organisms arrived at by improved methods of isolation and cultivation on gelatine or peptonised jellies, more exact information has been gained as to the trustworthiness of our many antiseptic agents.

The classical researches are those by Koch, and his results have been found to agree with subsequent clinical trial.

Koch's method was as follows: he dipped sterilised threads in cultivations of bacilli not containing spores, and others in those containing spores; the former were then immersed in a solution of carbolic acid (1 p. c.) for two minutes, and thereafter placed on some of the materials used for cultivation, and he found they did not grow; the latter (*i.e.*, those with spore-bearing bacilli) were however unaffected after being steeped even for two days in a 2 p. c. solution of carbolic acid. Immersion in even a 5 p. c. aqueous solution of carbolic acid did not render the spores incapable of development. 5 p. c. solutions in alcohol and in oil were ineffective on the *spores* even after 70 to 110 days' immersion; similar solutions destroyed the *bacilli* after six days' immersion.

The most powerful germicide was found to be corrosive sublimate, which in weak solutions (1 in 20,000) killed spore-bearing bacilli almost immediately, and inhibited their growth when of a strength of only 1 in

30,000. An evident difference exists between micro-organisms in relation to their resistance to antiseptics: bacilli without spores, and micrococci, are readily killed by a 1–20 aqueous solution of carbolic acid, while spores resist immersion in 1–20 carbolic lotion even for days.

Carbolic oil and alcoholic solutions of carbolic acid have proved inefficient as antiseptics, and should therefore be discarded in practice.

These researches give a guide in determining what antiseptics we should use, but require, as we shall see, to be accepted with some modification.

Activity of various Anti-septics.

The following is taken from a table given by Koch of the activity of various antiseptics. The double underlining means that after that number of days the spores of the bacillus anthracis were taken out of the fluid and found to be no longer capable of development. When the numeral is not so underlined it means that after immersion for the special number of days the spores were still capable of growth.

FLUID.	PERIOD (IN DAYS) OF THE IMMERSION OF THE SPORES IN THE FLUID.	REMARKS.
Absolute alcohol	1 3 5 . . . 110	
Æther	1 5 8* 30	*Incomplete growth.
Oil of Turpentine	1* 5 10	*Isolated but well-marked development.
Chlorine water	1 5	
Bromine (2 % in water)	1 5	
Iodine water	1	
Iron chloride	2* 6	*Delayed but well developed.
Sublimate (1 % in water)	1 2	
Thymol (5 % in alcohol)	1 6 10 15	
Salicylic acid (5 % in alcohol)	1 6 10 15	

In regard to thymol and salicylic acid it should be noted that alcoholic solutions were used, which, like oily solutions of antiseptics, are less effective than aqueous ones: *e.g.*, an alcoholic is less active than an aqueous solution of iodine. Koch's results have, however, been criticised in the following way. It has been shown by Geppert that if the thread with bacilli or spores were dipped in corrosive sublimate and then in ammonium sulphide so as to precipitate and render inert the corrosive sublimate on the thread, the organisms grew when transferred to gelatine. This tends to show that the micro-organisms were not killed by the antiseptic, but that their growth was inhibited by the corrosive sublimate present in the thread at its time of transfer. It also shows, however, that this dipping in certain antiseptics is reliable through the slight amount of antiseptic retained—an amount not prejudicial at all to the tissues.

We must now consider our chief antiseptics from the clinical standpoint.

Carbolic Acid.

Carbolic acid is in many respects one of our most trustworthy antiseptics. A watery solution of 1 in 20 is thoroughly effective except in the case of spore-bearing bacilli, and can be relied on in operative work. From its not acting on metals and having no injurious action on sponges, it is useful for cleaning these as well as for skin cleansing. A solution of 1 in 20 if prolonged in its use has, however, a disagreeable action on the skin and the odour is pronounced. It can be used with soaps. *Lysol* is a carbolic preparation with soap much employed now. *Creolin* is also an excellent preparation.

Corrosive Sublimate.

Corrosive sublimate was recommended in 1874 by Davaine, used by Tarnier in obstetrics prior to 1880, and was very many years ago the favourite antiseptic of the late A. B. Stirling, assistant-curator in the Edinburgh Anatomical Museum, so well known for his freezing-microtome and microscopic work. Since Koch found it the only germicide for the spores of bacillus anthracis, it has come into great prominence.

Solutions of 1 in 2000, 1 in 4000, 1 in 8000 are very effective; it is undoubtedly a valuable addition to antiseptics, as it is rapid in action, very soluble, odourless, and non-irritating to the hands. Its corrosive action on instruments and injury to sponges are the drawbacks to its use.

Some important facts as to the action of corrosive sublimate on soaps and blood albumin must be kept in mind. With ordinary soaps, albumin, or blood, we get insoluble and inert compounds formed. Thus if 5 c.c. blood be added to 50 c.c. corrosive sublimate (1–1000), nearly all the mercury is thrown down as albuminate of mercury. This precipitation of the mercury is prevented however by the addition of tartaric acid or common salt, so that $\frac{3}{4}$ p. c. to 1 p. c. salt solution should be used in making 1 to 1000 corrosive sublimate (Woodhead).

Biniodide of Mercury.

Biniodide of mercury is also very effective, and is believed to be better than corrosive sublimate, as it is doubly effective, and does not form insoluble compounds nor corrode metals much. These antiseptics are now made up in the form of compressed pellets, with tartaric acid in the case of the corrosive pellets. These are useful for the practitioner, prevent mistakes on the part of nurses, and are now in general use. Tartaric acid should not be added to the strong solutions of corrosive as it converts the latter into calomel in about a fortnight (Dott).

Iodoform, although it has little action on micro-organisms, seems to neutralise their products, and as a powder or gauze is most valuable in dressing wounds.

ASEPSIS.

sepsis. By this we mean a condition where no septic causes are present, this result being due to sterilisation by boiling water or moist steam. This condition can be brought about only in instruments and dressings, for evident reasons, and it is a decided advance in operative work from its simplicity and efficiency. The methods we discuss presently, but we may say that for operative work, one has to rely on a combination of antiseptics and sterilisation—antiseptics for the operator's hands and patient's skin, and sterilisation for instruments, wound-dressings, and the operator's and assistant's operating tunic, and for towels, etc., used.

The only difference between antisepsis and asepsis is in the cause. Antisepsis is asepsis aimed at by the use of antiseptics. Asepsis is brought about by boiling or steaming, and really attained in this way. It is doubtful if we can attain asepsis by the use of antiseptics.

We have therefore to discuss the question of how we can render free from contaminating material all that is within the operating field. This comprises the consideration of (1) the operating room; (2) the purification of the operator's hands, and those of his assistants and nurses; (3) the purification of the skin of the part to be operated on; (4) the purification and cleansing of towels, tampons, operating tunics, and dressings; (5) the preparation of sponges, swabs, and ligatures; (6) the sterilisation of instruments. It is of importance to keep in mind that our antiseptic and aseptic treatment need only be directed against certain micro-organisms, viz., those found normally in skin, and certain pathogenic organisms occasionally present. As a type of the former we may mention a micrococcus, the staphylococcus epidermidis albus described by Welch as normally present in skin. In the vagina a bacillus has been discovered by Döderlein, which he believes to have an acid secretion, and to act as a protective against micrococcal infection.

Pathogenic organisms may be present also on and in the deeper layers of the skin—usually, as in the vagina, some form of streptococcus or staphylococcus.

All these forms are killed by thorough antiseptic precautions, and it is not necessary to use such stringent antisepsis as, for instance, is required to destroy spore-bearing bacilli like the bacillus anthracis.

Various micrococci may be found in the lower segment of the genital tract, but the vagina, uterine cavity, and Fallopian tubes, when healthy, are practically aseptic. Organisms may of course be introduced by careless examinations with fingers or instruments not previously cleansed.

The Operating Room.

(1.) *The operating room.*—In a hospital the operating room should be so contrived that the floor is of an impermeable material, that the wall and roof are covered with a washable material, and that the corners are rounded so as not to lodge dust. The floor is therefore covered with impermeable cement, the walls with enamel varnish or some washable substance. An abundant supply of hot water is arranged for, with suitable hand-basins, with taps worked by the feet, and also apparatus for providing boiled water. There should be suitable tables for instruments, either with glass or metal tops, and on large castors so that they can be moved by the operator's foot. The arrangements should not be too elaborate, and we must remember that in private practice great simplicity of appliance is requisite. There the careful scrubbing of an ordinary wooden table, and its protection with sterilised sheets; the surrounding of the operating field with clean towels wrung out of hot carbolic lotion, or boiled in soda solution have often to suffice, and give excellent results. The field of mischief is practically bounded by the operator's hands.

Disinfection of Hands.

(2.) *The disinfection of the operator's hands and those of his assistants and nurses.*—Thorough cleansing of the hands is one of the most important parts of antiseptic treatment. It is now recognised that the mere dipping of the hands in an antiseptic lotion is insufficient, and that more thorough precautions are necessary. There can be little doubt, however, that extravagant statements are made on this point to the extent that practically no means of cleansing the hands can rid them of all micro-organisms. Various micrococci may be found normally in the skin and sweat glands, usually innocent organisms; and the operator may of course in touching putrid wounds infect his skin with pathogenic micrococci. It is of great importance, therefore, to make the cleansing of the hands a very thorough procedure. They should be first thoroughly scrubbed with soap and hot water for ten minutes by means of a sterilised nail-brush that is preserved in 1–2000 sublimate lotion. Nails should be short, and special care must be taken with the subungual spaces. To free the surface from greasy matter, turpentine or lysol is very useful, and finally a thorough friction with sublimate lotion (1–2000) for five minutes completes the process. Other methods may be employed, viz. (1) use of hot water and soap, followed by (2) immersion in alcohol, and (3) scrubbing with carbolic lotion (1–50). Immersion of the hands in saturated permanganate of potash after the use of soap and water, and the discharge of the deep staining with saturated oxalic acid solution, followed by sterilised lime-water, sterilised water, and finally immersion in sublimate lotion (1–500) for five minutes, has been also recommended as very thorough (Robb).

When the operator and his assistants have thus cleansed the hands and arms prior to operation, they must not accidentally in forgetfulness soil them by touching unclean articles.

The same care must be taken with the hands of the assistants and nurses, and it is advisable that all engaged within the operating field should be provided with tunics or blouses sterilised in a way to be described afterwards.

Disinfection of Patient.

(3.) Great care must be taken to disinfect *the part to be operated on.* Two nights before operation the patient has a bath, is thoroughly cleansed and shaved locally, and has a soda soak applied over the abdomen.

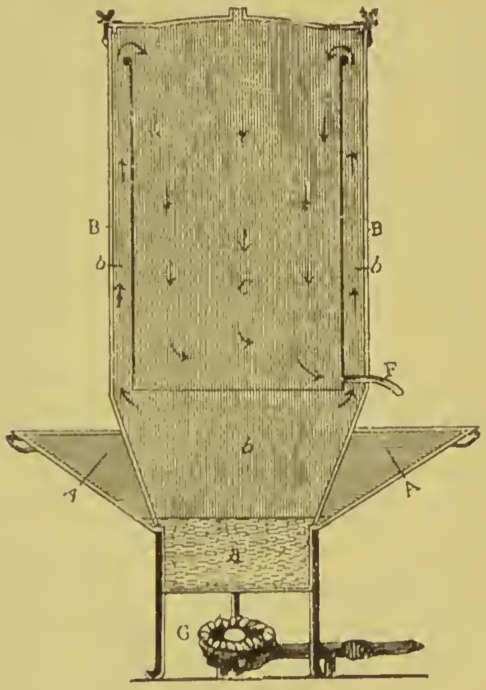

Fig. 96.

Diagram of Steriliser to contain Schimmelbusch's Box. The arrows show the direction of the steam. (*Sänger.*)

The abdominal surface is cleansed with turpentine, soap and water and carbolic lotion (1–40) the night before the operation. Special care should be taken with the navel. A weak carbolic or corrosive soak is then applied. The operator should himself cleanse the patient's skin before operation with soap and carbolic lotion (1–40), finally drying it with a sterilised towel.

For the perineal region one uses the same precautions—viz., a sitz-bath the previous evening, shaving the genitals, washing them with turpentine, soap and water, finally scrubbing with carbolic lotion (1–30) before operation. The vagina should be well brushed with a handled sterilised brush and carbolic lotion. Special directions for cervical and other operations will be given under the separate operations.

Purification of Dressings.

(4.) *The purification and cleansing of tampons, towels, operating tunics, swabs, and dressings.*—For this purpose it is now held rightly that sterilisation with steam is best. Dry heat at a temperature of 120°–140° C. has been used, but it is more difficult to apply, and, owing to its want of penetration, is not so effective.

For sterilisation by steam we require a special apparatus, and of these many varieties are made. The operator may use a simple one such as that of Schimmelbusch (fig. 96), but more elaborate and fixed ones are employed for large hospitals.

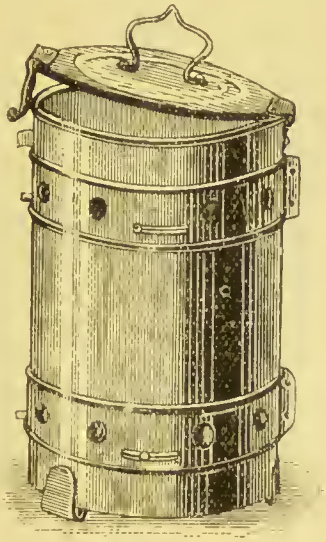

FIG. 97.

SCHIMMELBUSCH'S BOX. It can be filled with tampons, operating tunics, and placed in Steriliser. (*Sänger.*)

In these sterilisers the various articles to be enumerated presently are placed, and subjected to the action of nascent steam for half-an-hour. The air is thus driven out, and the contents of the steriliser thoroughly impregnated with vapour, and all micro-organisms completely destroyed. The steam should enter from above, and the dressing warmed before it is passed in. The dressings do not require to be dried after the sterilisation is over.

The articles that can be so sterilised are gauze, gauze tampons, operating tunics, sheets, and towels.

Gauze dressings and tampons are suitably prepared and placed in dressing boxes. These dressing boxes are provided with lids, and have perforations that can be open or shut, so that when filled with gauze the holes can be uncovered and the steam penetrates. When thoroughly sterilised the box is closed, and can then be kept until required for use (*v.* fig. 97). These boxes are of great use, and provide a ready stock of dressings for private and country work.

If necessary, iodoform can be sprinkled on the gauze moistened with sterilised water, and pressed into the dressing with a sterilised rod or glass presser. Gauze tampons can be made of gauze sewn round pads of salicylic wool. They are useful instead of sponges for perineal operations, and by some operators are used instead of sponges in abdominal section.

It will be readily understood that operating tunics, towels, and sheets can be sterilised in the same manner.

Sponges, Swabs, and Ligatures.

(5.) *The preparation of sponges, swabs, and ligatures.*—Sponges after operation should be thoroughly washed with abundant water, then soaked in very hot soda solution (1 per cent.) for half-an-hour, but they are not to be boiled, as this destroys them. They are then rinsed in boiled water, soaked in carbolic lotion (1–20) for twenty-four hours, and either kept permanently in this, or dried, and soaked in carbolic lotion (1–20) for twenty-four hours prior to operation.

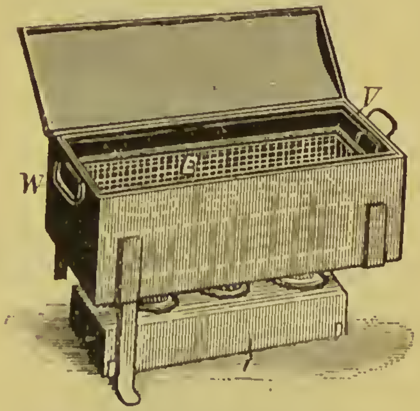

FIG. 98.

SCHIMMELBUSCH'S STERILISER FOR INSTRUMENTS. In this they can be boiled in a 1 per cent. soda solution.

New sponges require the sand removed from them. They should be beaten well, soaked in hydrochloric acid and water, sufficiently bitter to be unpleasant to the taste, and then treated as above. The greatest care requires to be exercised in regard to sponges. Good sponges are expensive, but with care will last for some time. They excel swabs in absorbability, but are more difficult to disinfect.

Swabs are now in general use, and are made of suitable sizes—large ones being folded from a piece a yard square, smaller ones from one half a yard square; the cut edges should be folded in.

Ligatures.—These are usually silk, catgut, and silkworm gut.

Silk can be had in various thicknesses, and is usually sterilised by boiling in plain water for an hour.

Catgut has now come into great prominence, and is used throughout in abdominal operations by many operators. It is the submucous coat of the sheep's intestine, and requires to be specially prepared so as to render it aseptic. The following is the way in which it is prepared at the Edinburgh Royal Infirmary by T. Alexander, of the Laboratory Department:—

(1) Commercial catgut is wound in 75 cm. lengths on spools. (2) This is washed with ether. (3) It is then placed in mercuric chloride and ether (1–1000) for some time, never less than one week. (4) It is then boiled in absolute spirit for one hour, and the boiling repeated, for large sizes, after some hours. (5) It is finally transferred to sterile bottles containing absolute spirit and mercuric chloride (1–2000). It should be taken directly from the bottle for use and not placed in antiseptic fluids.

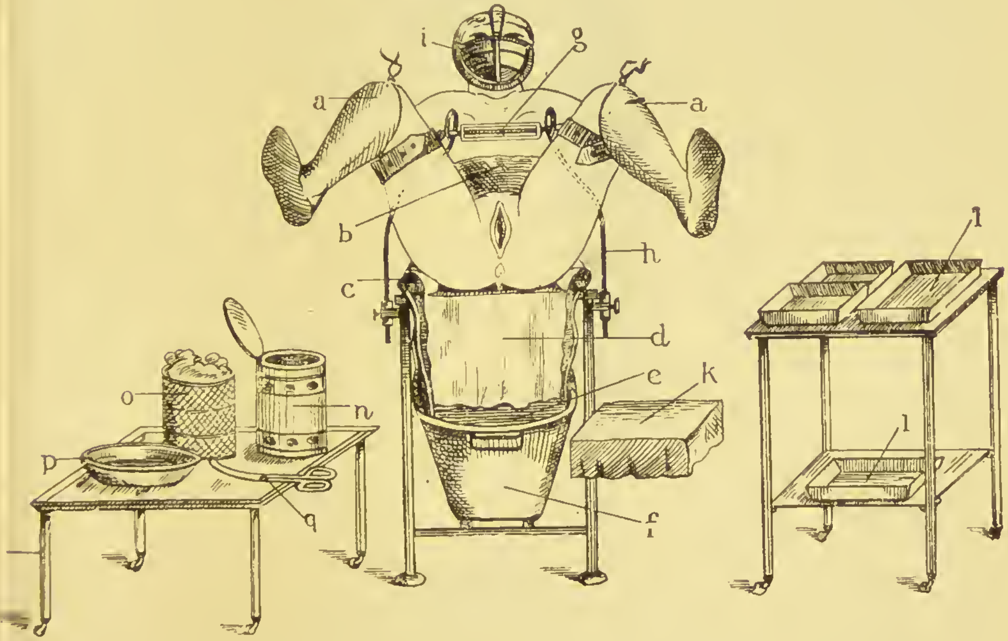

FIG. 99.

ARRANGEMENT FOR OPERATION ON PATIENT IN LITHOTOMY POSTURE (*Sänger*).

a, Limbs in leg-holder (*h*) and covered with sterilised stockings; *b*, sterilised gauze pad; *c* is air-pad with gauze napkin, *d*, and flap, *e*; *f* is bath for overflow; *i*, chloroform mask; *k*, movable glass shelf; *l*, table for instrument clerk; *m* is a lower table within reach of the operator; *n*, box for sterilised tampons; *o* has sterilised wool; *p*, dish for sublimate lotion, and *q*, forceps.

To get a more lasting catgut, prepared carbolised chromic gut has the oil removed by ether, and is then boiled and stored as in (4) and (5) (Brewis).

Cumol catgut sterilised by being boiled in cumol, which has a high boiling point (165° C.), is strongly recommended by Kelly (*Operative Gynecology*, p. 13, Vol. I.). It is stored in sterilised and plugged tubes.

Silkworm gut is sterilised by boiling, and is non-absorbable.

The great advantage of catgut is its absorbability, but there is some risk of its not being aseptic. Silk can be rendered thoroughly aseptic, but is very slowly absorbed, and may give rise to trouble afterwards.

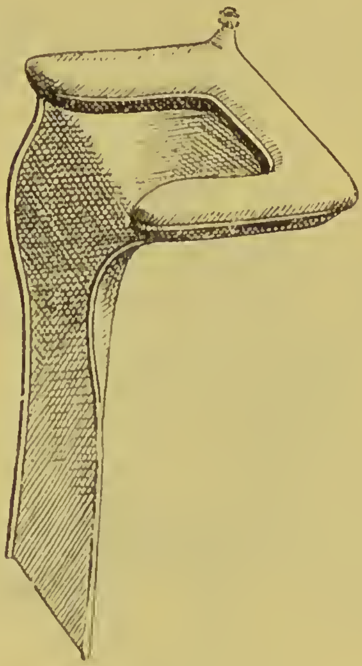

FIG. 100.

PAD (Kelly), modified by Sanger.

Instruments.

(6.) *The sterilisation of instruments.*—Sterilisation of instruments can be most effectively carried out by boiling them in a simple apparatus filled with soda solution.

The steriliser for instruments (fig. 98) is a box made of tin or copper, with a tightly fitting lid and four legs, removable. Heat is supplied by a spirit lamp. The instruments are placed on a perforated tray with a handle at each end, and this is put into the steriliser with soda solution. The lid should be firmly closed, the lamp lighted, and the instruments in this way boiled for an hour. They are then thoroughly aseptic, and are ready for operation when cooled either by adding boiled water or 1–20 carbolic lotion to the steriliser. During the operation they can remain in the steriliser or be placed in shallow trays in 1–60 carbolic lotion or sterilised water.

The operator's aim is, therefore, to have hands thoroughly cleansed with antiseptics, to operate on a thoroughly pure surface, to have such a disinfection by sterilisation of operating tunics, of the necessary towels and sheets surrounding the patient, and of the instruments, swabs, ligatures, etc., that everything touching the wound or touched by the operator is free from septic causes—*i.e.*, carries no micro organismal contamination. His purpose is finally completed by the application of a dry sterilised dressing impregnated, if necessary, with iodoform, so that no septic organism can contaminate the wound secretions.

This requires great vigilance and care on the part of the operator, careful drilling of assistants, and a thorough knowledge of bacteriological results, all tempered with common sense.

Fig. 99 shows a patient arranged for such an operation as hysterectomy or one of the perineal operations. A convenient pad for operations is seen at fig. 100 (Kelly).

PART II.

DISEASES OF THE FEMALE PELVIC ORGANS.

After considering the etiology and classification of the diseases of the female pelvic organs, we shall adopt a classification based on anatomy, grouping the diseases under the structure affected. We shall devote one section to each group of affections as follows :—

Section III. The Peritoneum and Connective Tissue ;
,, IV. The Fallopian Tubes and Ovaries ;
,, V. The Uterus ;
,, VI. The Vagina ;
,, VII. The Vulva and the Pelvic Floor.

Further, we shall consider under special sections disturbances of the following functions :—

Section VIII. The Menstrual function ;
,, IX. The Reproductive function.

Finally, we shall devote one section to affections of the other pelvic organs :—

Section X. The Bladder and the Rectum.

In an Appendix there will be considered Abdominal Section ; Electricity in Gynecology ; the Systematic Treatment of Nerve Prostration ; Casetaking ; and Gynecological Literature.

SECTION III.

AFFECTIONS OF PERITONEUM AND CONNECTIVE TISSUE.

Chapter XVI. Etiology and Classification of Gynecological Diseases.
,, XVII. Pelvic Peritonitis and Pelvic Cellulitis.
,, XVIII. Pelvic Hæmatocele and Hæmatoma: New Growths in the Pelvic Peritoneum and Connective Tissue.

CHAPTER XVI.

THE ETIOLOGY AND CLASSIFICATION OF GYNECOLOGICAL DISEASES.

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GYNECOLOGY was at first a branch of general medicine, and the existence of special pelvic disease was inferred usually from reflex pains in the left inframammary, sacral or iliac regions, and from disturbance of the menstrual functions, or excess of leucorrhœa. Little progress was made until the discovery of the use of instruments of precision (sound, speculum, etc.); but even then any operative treatment was minor, so that real pathological advances were awanting until the abundant abdominal, vaginal, and uterine surgery of the past twenty years gave fresh material for investigation and research, and actual demonstration of hitherto obscure pelvic conditions. Gynecology has also shared in the valuable work of the bacteriologist, and in the advances of antiseptic surgery, so that we are now bound to reconsider some essential points, viz., the etiology of uterine diseases, and the question of how we are to classify them.

THE ETIOLOGY OF GYNECOLOGICAL DISEASES.

It is very remarkable that attempts to give a complete etiological account of Diseases of Women were made early in the history of Gynecology. Dr J. Henry Bennet, who published his Treatise on Inflammation of the Uterus in 1845, a work characterised by great ability, attempted then and in subsequent years to found a system of uterine pathology, and asserted that in cervical inflammation and ulceration we had the conditions which formed the most common pelvic lesions in women, and that many other diseases could be distinctly traced as secondary to them. Other observers merely substituted another diseased organ for the cervix, and made some of its diseased conditions the principal ones to which many others were secondary. Thus Tilt assigned the leading place to inflammatory conditions of the ovary: Hewitt asserted that given a flexion or a version, you had conditions important in themselves and originating almost all gynecological diseases; while not a few held that uterine disorders were really due to constitutional conditions. All these attempts were more akin to the efforts of deductive philosophy, where the philosopher started with some apparently impregnable definition and explained the world and mankind in a series of elaborate deductions from it, than to scientific pathology.

These attempts, most praiseworthy at the time, and in the state of knowledge then, probably the only possible, have failed, and one must now recognise that the etiology of gynecological disease is the same as that of the diseases of other organs, only modified by structure and function.

Factors in the Etiology of Disease.

In the Etiology of Diseases of Women, the following may be considered important factors, not sharply separated, but combining with one another:—

(1.) The special anatomical relations of the pelvic organs;
(2.) Their development and its occasional defects;
(3.) The functions of menstruation, the sexual relations, pregnancy, labour, the puerperal state;
(4.) Micro-organismal causes.

(1.) *The special anatomical relations of the pelvic organs.*—The most important of these are the abundant vascular supply of the pelvic tissues, its specially rich lymphatic arrangements, and above all the fact that the peritoneal cavity is not a closed sac as in the male, but that there is actual continuity of peritoneal and tubal epithelium, with that of the genital tract below. The preponderance of pathological conditions behind the broad ligament and in the pouch of Douglas, is undoubtedly to be correlated with this, and also with the fact that the ostium abdominale of the tube opens in that neighbourhood. We have thus from this continuity, and also the lymphatic distribution, access to the peritoneum for pathogenic organisms.

(2.) *Their development and its occasional defects.* — We need only mention here the development of uterus and vagina from the ducts of Müller, the early *rôle* of the Wolffian ducts and bodies, and the peculiar development of the ovary, and the great fact that disturbances may arise in these, and give rise to malformations and new growths (*v.* Chap. on Ovarian Pathology).

(3.) *The functions of menstruation, the sexual relations, pregnancy, labour, and the puerperal state.*—The functions of menstruation may be disturbed by congenital malformation, and when once inflammatory conditions have been set up, we get interference with the turgescence and erection of the organs during the period, and pain more or less severe as a result.

With the sexual relations is mainly to be associated gonorrhœal infection. So far as is known, syphilis is not, apart from its own lesions, an important factor in Gynecology, although in the production of abortion it is all-powerful.

The micro-organismal nature of gonorrhœa and the anatomical relations of the parts already alluded to, give most favourable opportunities for its spread, and render its cure when present most difficult.

The actual lacerations in normal and abnormal labour, septic conditions arising from incomplete expulsion of membrane during the third stage, and the mismanagement of abortion cases by the neglect of the patient or medical attendant, form by far the most fruitful source of Gynecological trouble. It is not too much to say that careful management of labour and abortion would reduce gynecological cases by a very large fraction.

In extrauterine gestation we have a factor, recently more thoroughly recognised, in the production of blood-effusions in the tubes, connective tissues, and peritoneum.

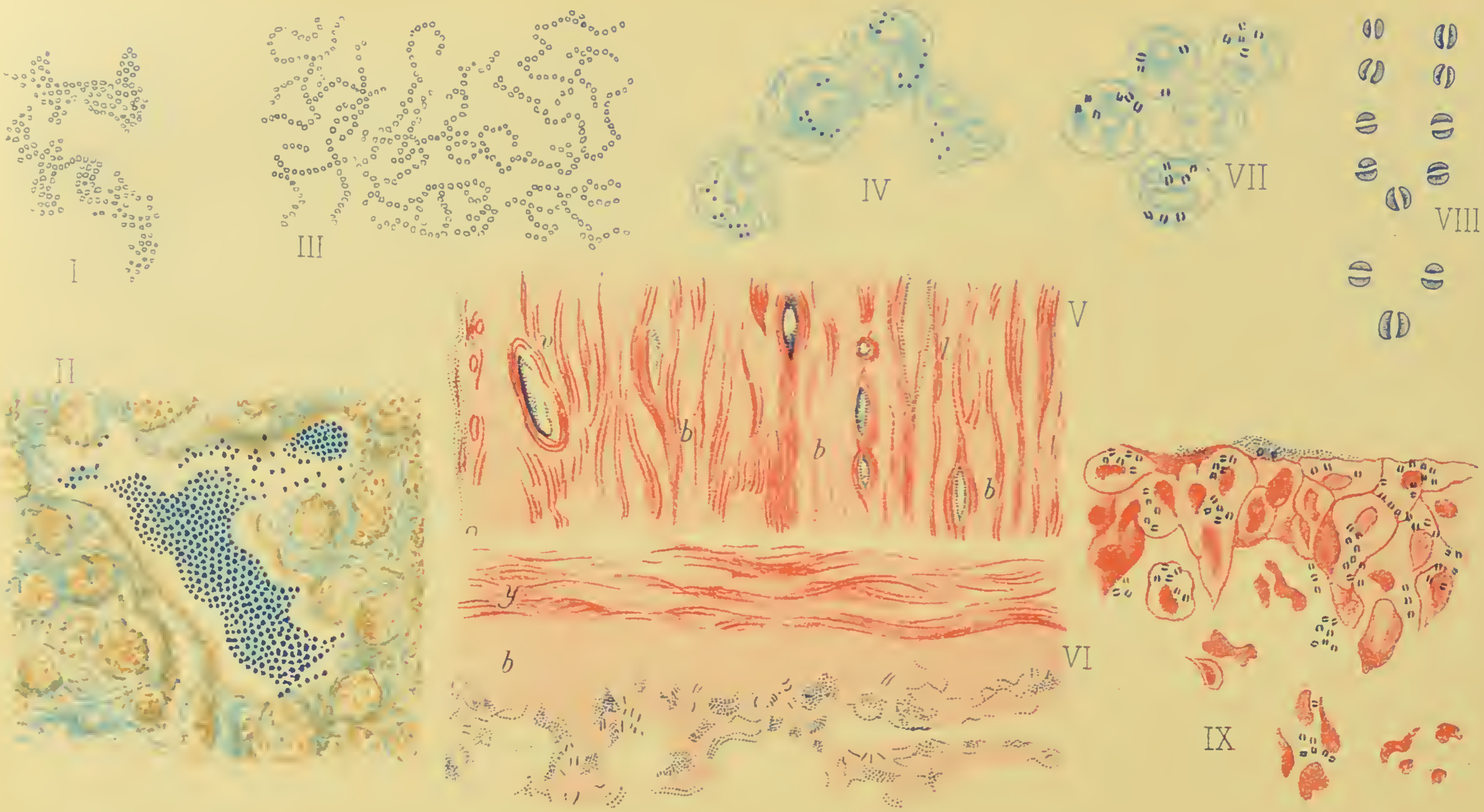
Micro-organisms as causes.

(4.) *Micro-organismal causes.*—This is one of the most important factors in the Etiology of Gynecology, and it is in the region of bacteriology that the most useful and permanent advances have been made. The result of bacteriological investigation has not only been of the greatest value in itself, but has completely overthrown much absurd pathology and noxious meddlesome treatment.

The following micro-organisms are recognised as causing specific diseases: Bacillus tuberculosis of Koch; the Gonococcus of Neisser; Streptococci; and one rare fungus—the Actinomyces bovis may also be noted. We do not here consider parasitic pediculi, parasites causing skin diseases, or tæniæ causing pelvic hydatids.

Bacillus of Tubercle.

Bacillus tuberculosis. — The discovery of this micro-organism by Koch in 1882 has given great precision to our knowledge of genital tuberculosis. The bacillus is in the form of a rod with rounded ends 1·5 to 3·5 μ in length. It probably forms spores. The special microscopic anatomy will be considered under the organs, but we may note here that by the discovery of the bacillus we now know accurately that tuberculosis occurs rarely in the vulva, more frequently in the vagina and bladder, quite frequently in the body of the uterus (although rare



MICRO-ORGANISMS AND THEIR RELATION TO THE TISSUES, *v.* p. 161. (Doléris and Pichevin)

I. Staphylococcus pyogenes aureus; same in the liver—II. III. Streptococci of septicæmia; same in epithelium and leucocytes—IV.; in muscular walls of uterus—V.; in puerperal mucosa—VI. VII. Gonococci in pus; enlarged and diagrammatic VIII.; in epithelium IX.

in the cervix), most frequently of all in the tubes. In the ovary it is fairly common, and quite common in the peritoneum.

Genital tuberculosis arises by the spread from neighbouring affected tissues (viz., peritoneum, intestine) through the blood, by autoinfection, from tuberculous stools, and probably by coitus. In dogs, where tuberculosis of the testicle has been artificially produced, tubercle bacilli have been found afterwards in the seminal fluid.

Gonococcus.

The Gonococcus. — The discovery of the gonococcus as the cause of gonorrhœa by Neisser in 1879 has proved a most important advance.

Neisser's gonococcus exists in the form of diplococci—double micrococci 1·5 μ. in diameter, and so placed that their concave surfaces are close together. It grows on human blood serum between 30° and 40° C., and pure cultivations inoculated in the healthy human urethra give rise to gonorrhœa (Bumm). It is the undoubted cause of gonorrhœa.

Bumm has alleged that the gonococcus grows only on columnar epithelium, but, according to Wertheim, it can also penetrate deeper, and burrow in connective tissue.

Streptococcus.

Streptococci have been found in tubal conditions, in cellulitis, and in peritonitic exudations, and thus play an important part in septic inflammatory conditions. They also form toxines.

Actinomyces.

Actinomyces bovis.—This rare fungus has been found in a very few cases to be the cause of suppurative conditions in the ovary. Its structure is that of granulation tissue containing masses which stain deeply with aniline dyes, and are composed of club-shaped bodies.

Plate IV., from Doléris and Pichevin, shows the most important micro-organisms, and their appearance in the tissues. I. Staphylococcus pyogenes aureus (Crookshank). II. Metastatic colony of staphylococcus pyogenes aureus in the liver (Crookshank). III. Streptococci of septicæmia and erysipelas (Doléris). IV. Streptococci in epithelium and in leucocytes (Cornil and Babes). V. Streptococci in the muscular coat of the uterus and in the vessels: *b*, muscle; *v*, vein; *l*, lymphatic (Widal). VI. Streptococci in the puerperal mucosa: *b*, chorion; *y*, muscle (Widal). VII. Gonococci in pus (Cornil and Babes). VIII. Gonococci (diagrammatic). IX. Gonococci in the epithelium of the conjunctiva (Cornil and Babes).

METHODS FOR DETECTING THESE MICRO-ORGANISMS.

Bacteriological Methods.

It is of great importance that all fluids and specimens obtained clinically should be examined by the gynecologist both microscopically and bacteriologically. We give here, therefore, a summary of the methods used at the laboratory of the Royal College of Physicians, Edinburgh, for which we are indebted to Mr J. Hume Patterson, Laboratory Assistant there.

Examination for Staphylo- and Strepto-cocci.

Staphylococcus pyogenes albus, aureus, and Streptococcus pyogenes.—Receive the pus or fluid to be examined into a sterilised flask or test-tube. With a platinum needle, which has been heated in the flame of a Bunsen burner or a spirit-lamp, lift a little of the fluid and smear it over the surface of a slightly alkaline agar tube, and, without recharging the needle, inoculate other two agar tubes in succession.

Label the tubes 1, 2, and 3, and place in an incubator at a temperature of 35° C. over night.

In the morning growths should appear in each of the tubes, but they may be so numerous in No. 1 as to make it quite impossible to isolate and examine them separately. This should be easily done with the second or third dilution.

The staphylococcus pyogenes albus appears in small round white colonies with moist surface, and raised on the surface of the agar agar.

The staphylococcus pyogenes aureus appears as small round cream-coloured colonies with moist surface, and raised on the surface of the agar. The colonies after a day or so become golden in colour.

The streptococcus pyogenes appears as small round greyish transparent looking colonies, and is easily distinguished from the staphylococcus aureus and albus.

With a sterilised platinum needle inoculate gelatine (10°/$_{0}$) tubes, and keep at the temperature of the room; growths should appear in a few days. The staphylococcus albus and aureus liquefy the gelatine in three or four days after commencement of growth. The streptococcus *does not* liquefy gelatine.

Also make cover-glass preparations from the agar tubes, by rubbing a small quantity of the growth on a cover-glass with a drop of distilled water. To fix the film, allow to dry, and pass three times through the flame of a Bunsen burner with the back of cover-glass to the flame.

Stain as follows. Put one drop of saturated watery solution of methyl green and one drop of saturated watery solution of dahlia into a watch-glass, and dilute with distilled water. Place a drop of the stain on a slide, and put the cover-glass preparation face down on the stain, and examine.

A permanent preparation may be made after examining, by washing the coverslip in water, allowing to dry, and mounting in xylol balsam.

Cover-glass preparations may also be stained in a saturated watery solution of methyl blue or gentian violet for a few minutes, washed in water, allowed to dry, and mounted in xylol balsam.

Examination for Gonococci.

Gonococcus.—Make cover-glass preparations from the discharge, or, if a urine, centrifuge first, and prepare coverslips from the deposit.

Stain by Gram's method (alcoholic solution of gentian violet 1 part, aniline oil water 8 parts; shake well up, and filter into a watch-glass; stain films for three or four minutes: rinse very slightly in absolute alcohol, place in Gram's solution for five or ten minutes, and decolourise in absolute alcohol). Then counter-stain with weak solution of saffranine in water for three or four minutes, wash in water, allow to dry, and mount in xylol balsam.

The gonococcus and the pus corpuscles are decolourised with Gram's solution, and are stained red with the saffranine, while the other organisms are stained violet.

The gonococci are seen in groups either between or in the pus cells. The gonococci are sometimes so few in number that it is difficult to detect them in this way, and in that case cultures should be made in the following manner. With a platinum loop-needle, which has been sterilised, rub some blood, taken under sterile precautions, over the surface of an agar tube. The blood can be obtained either by sterilising one's own finger with soap and water, corrosive sublimate (1–2000), and methylated spirit, and then pricking it with a sterilised needle or scalpel; or the ear of a rabbit may be used.

Inoculate the tubes with the pus or deposit, and place in the incubator at 35° C.

The growth appears as small round greyish transparent-looking colonies, similar in appearance to the streptococcus pyogenes.

Coverslips are made and stained by Gram's method and saffranine.

Examination for Tubercle Bacillus.

Tubercle Bacillus.—Make cover-glass films by taking a small quantity of the sputum or centrifuged urine with a needle and placing on a cover-glass; then place a clean coverslip on the top and squeeze the two together; wipe round the edges with a piece filter paper, which should be burned afterwards; separate the coverslips by sliding the top one off. Pass three times through a Bunsen flame with back of cover-glass to the flame, in order to fix the film.

If sputum is thin, centrifuge first and use the deposit. Centrifuge also in the case of a urine.

Stain in the following manner: Filter some Ziehl-Neelsen fuchsine (carbolic acid crystals, 5 parts; aqua dest., 100 parts; absolute alcohol, 10 parts; fuchsine, 2 parts) into a watch-glass, and place coverslips face down on the stain, and warm gently for a few minutes. Wash in water.

Decolourise in 25°/₀ sulphuric acid for at least a minute. Wash in water.

Counter-stain in methyl blue (saturated watery solution of methyl blue with an equal part of aqua dest.). Wash in water, allow to dry, and mount in xylol balsam.

The tubercle bacilli are stained red.

Sections of tissues are treated in a similar way, but are stained for *an hour* in a warm solution of the stain, or twelve hours in a cold solution.

After being stained with the methyl blue, they are washed in water, absolute alcohol, cleared up with clove oil, xylol, and mounted in xylol balsam.

Pus.—The bacilli are so few in number, that it is useless to stain.

The best method is to inject some of the pus into the peritoneal cavity of a guinea-pig, and kill it in ten days after, when the *post-mortem* will show whether tubercle is present.

Cultures of the tubercle bacillus may be made on blood serum or 6°/₀ glycerine agar agar.

After inoculation they are placed in an incubator from four to six weeks.

Examination of Fresh Tissues.

Rapid Method of cutting Fresh Tissues.—Place piece tissue 1 × ·5 × ·2 cm. for two hours in 10°/₀ watery solution of formaline. Freeze on ice microtome and cut.

Place the sections for three minutes in 50°/₀ formaline solution, then three minutes in 50°/₀ alcohol, and one minute in absolute alcohol; then wash sections and stain.

The tissue may also be at once frozen and cut, and the sections treated as above.

The fresh tissue may indeed be frozen at once, the sections hardened in formaline (2°/₀) for a few minutes, washed in water, stained in alum carmine, and then passed through water and alcohol (80°/₀, two to three minutes), absolute alcohol (ten seconds), carbol-xylol, and balsam.

THE CLASSIFICATION OF GYNECOLOGICAL DISEASES.

Most writers of gynecological text-books adopt an *anatomical* classification of the diseases considered. They either begin with peritonitis and cellulitis, taking up the diseases of the other genital organs in a regular downward anatomical sequence; or, they begin with vulvar disease, and reverse the order.

The first plan is the better one, and either indeed will be our only feasible one for many years yet. The former has lost some of its value, since the importance of tubal disease, in relation to peritonitis especially, has become known,—since, in fact, the importance of primary peritonitis has been curtailed. But all the same we cannot at present adopt any other method without confusion, and without serious gaps in the arrangement.

The anatomical arrangement has further this supreme convenience, that it groups together the diseases of the organs compactly, and is thus the only plan of arrangement suitable for the student.

Another system of classification is the *pathological*, but we defer consideration of this to the Appendix.

CHAPTER XVII.

PELVIC PERITONITIS AND PELVIC CELLULITIS.

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Pelvic Peritonitis.

In treating of the subjects of pelvic peritonitis and pelvic cellulitis it will be convenient to take up some preliminary matter and then to consider separately each condition under the following heads:—

Nature,
Pathological anatomy and varieties,
Etiology,
Symptoms,
Physical Signs,
Diagnosis and differential diagnosis,
Course and results,
Prognosis,
Treatment.

PELVIC PERITONITIS.

In the pelvis there may occur various inflammatory thickenings and exudations. Up till some years ago these were considered either peritonitic or cellulitic and treated mainly medically; but abdominal section, practised so frequently now, has brought out the fact that pus either in the tube or opening up the layers of the broad ligament is more common than was supposed. Thus the medical treatment of such cases has greatly diminished, and the gynecologist, when he finds that they do not yield, or are not likely to yield, to minor measures, resorts to abdominal or vaginal section to solve the exact nature of, and cure the case by removal of diseased organs or free drainage.

Thus while we consider, in the present section, pelvic peritonitis and pelvic cellulitis, salpingitis is very often causal to peritonitis, and may simulate it and cellulitis clinically. It would be simpler, therefore, to consider them together clinically, as Kelly has done, at least as regards their treatment; but a systematic account of them is also useful, and the combined view of their mutual relations can be considered later on.

The student must specially note that pelvic peritonitis is a secondary condition. The old idea of it as a primary one, mainly, and as resulting from an initial congestion due to mere vascular disturbance, must be given up, and with it much of the antiphlogistic treatment that has sunk so deeply into our therapeutics. As to the peritoneal area, we must keep in mind that the pelvic peritoneum is a part where the inflammatory disturbance occurs with less virulence than in other sites, such as the peritoneum over the intestinal coils.

It is to be noted too that a peritonitis beginning in the pelvis may become general. We do not, however, take up this question at the present stage.

Synonyms.—Perimetritis: Pelveo-peritonitis.

Nature.—An acute or chronic inflammatory condition affecting chiefly the pelvic peritoneum.

PATHOLOGICAL ANATOMY AND VARIETIES.

In the early stages, the peritoneum is injected and the epithelial cells dull in lustre. Soon, in marked cases, fibrinous or serous fluid is poured out: the former stiffens the peritoneum and often causes extensive adhesions between uterus and rectum, Fallopian tubes and ovary; the latter either remains free in the cavity, or becomes encysted by the false membranes already alluded to, often making Douglas' pouch to bulge down. In bad cases pus is rapidly formed. We may therefore speak of simple pelvic peritonitis, adhesive pelvic peritonitis, and serous or purulent pelvic peritonitis. These, however, are mere varieties. Tuberculous and malignant peritonitis will be considered by themselves.

Pathological Anatomy.

Varieties.

ETIOLOGY.

While the micro-organismal origin of peritonitis is being more and more demonstrated, it is convenient clinically to group the causes under the following heads :—

Etiology.

1. The existence of pelvic cellulitis, pelvic hæmatocele, ovaritis, ovarian tumour, fibroid tumour, tubercle, or carcinoma.
2. Childbirth and abortion.
3. Gonorrhœa.
4. Latent gonorrhœa in the male.
5. A chill, especially during menstruation.
6. Instrumental examination by the sound, stem pessaries, sponge, laminaria, or tangle tents.
7. Tubal disease.

1. *The existence of pelvic cellulitis, pelvic hæmatocele, ovaritis, ovarian tumour, fibroid tumour, tubercle, or carcinoma.*

We have already noted that marked pelvic cellulitis is always associated with some pelvic peritonitis. The pelvic peritoneum and cellular tissue are adjacent and intimately connected with one another in their vascular, nervous, and especially in their lymphatic supply; we have already seen how the stomata of the peritoneum communicate with subendothelial lymphatics, this being really due to protoplasmic retraction of the cells. In the same way we can understand a pelvic peritonitis arising secondarily from ovaritis. A hæmatocele is always followed by inflammatory changes in the peritoneum.

Ovarian tumours often set up pelvic peritonitis after being tapped, or from torsion of their pedicle—a fact of the highest importance as regards the operation of ovariotomy. Occasionally we get general peritonitis from suppuration of a small ovarian tumour and its perforation, with escape of pus into the peritoneal cavity, and a perforating pyosalpinx has a like result. Fibroids, tubercle, and cancer may also do the same, and thus give rise to considerable difficulty in diagnosis.

2. *Childbirth and abortion.*—When an inflammatory lesion follows these, it is generally cellulitic and, as we shall afterwards see, probably septic. Pelvic peritonitis often enough follows, and is then likewise septic. The organisms causing septic attacks are now considered to be bacilli or cocci, and pass either by the lymphatics or blood-vessels. In mischief arising from the intestine, the bacterium coli commune is the organism. Of the cocci the streptococcus pyogenes is the most virulent.

3. *Gonorrhœa* is one great cause of peritonitis. It results from actual spread of the gonorrhœal virus. The purulent infection probably passes along the Fallopian tubes and out at the fimbriated end, setting up a severe peritonitis; or it passes by the tissues themselves, spreading along the lymphatics. In puerperal women, gonorrhœa is by no means innocent, as the following case by A. R. Simpson shows:—

"J. C., primipara, prostitute, æt. 18, was admitted to the hospital and delivered of a male child. On the afternoon following, severe peritonitis set in which proved fatal in ten days. On *post-mortem* the abdomen contained ℥ viii. of yellow pus. Surface of intestines covered with recent fibrinous lymph becoming purulent. Mucous membrane of bladder much congested and in certain areas rough and granular. . . . On squeezing the Fallopian tubes a large quantity of pus was expelled, and the tubes appeared to be much distended with it. Mucous membrane much congested." (Report by D. J. Hamilton.)

4. *Latent gonorrhœa in the male.*—By this term Noeggerath of New York, who first directed attention to the subject, means a gonorrhœa in the male apparently cured, but with a few gonococci persisting, which sometime after—even years—infects the healthy female genital tract, causing discharge and pelvic peritonitic disturbance. The authors have seen cases bearing out Noeggerath's views, and this theory is now generally admitted.

5. *Chill, especially during menstruation.*—It is an old view that the pelvic congestion of menstruation may under undue exposure to cold pass into peritonitis; but proof is lacking.

6. *Instrumental manipulation.*—This is alluded to under the various instruments and needs mere mention here.

7. *Tubal disease.* This is now recognised as an important cause of pelvic peritonitis, and has been above alluded to under *Gonorrhœa.* The facts that the genital tract communicates with the peritoneal cavity through the Fallopian tubes, and that gonorrhœa and septic diseases are due to micro-organisms, explain, in most instances, the causation of peritonitis. Tubal disease and peritonitis are mutually related, inasmuch as occlusion of the tube may be set up after the peritonitis and thus tubal distention follow. Gonorrhœal pus sets up,

according to Bumm, limited peritonitis, the explanation given being that the gonococcus, its specific organism, does not flourish on squamous as it does on cylindrical epithelium. Wertheim has however shown that Bumm's view is untenable, and that the gonococcus can spread by tissue and not only superficially. The micrococci found in septic pus set up violent peritonitis when introduced into the peritoneal cavity. Some operators, if pus is found during a section, have it stained, and drain when streptococci are found, but not in the case of gonococci.

Bernutz's Analysis.

We append Bernutz's analysis of the causes of pelvic peritonitis in ninety-nine cases :—

43 occurred in puerperæ.
28 ,, after gonorrhœa.
20 ,, during menstruation.
8 traumatic
  3 due to venereal excess.
  2 ,, syphilitic diseases of cervix.
  2 ,, introduction of the uterine sound.
  1 ,, use of the vaginal douche.

SYMPTOMS AND PHYSICAL SIGNS.

A. Acute Peritonitis.

Symptoms

Symptoms. Increased, full, and bounding pulse ; increased temperature ; rigor ; shooting pains very severe.

Physical Signs.

Physical Signs. On palpation of lower part of abdomen the patient complains of pain ; and the abdominal muscles, apart from the patient's volition resist pressure. She lies usually on the back, and with both legs drawn up. There is usually an increase in the number of leucocytes in the blood (*see* page 180).

On vaginal examination the vagina feels hot and tender, and pulsating vessels may be felt in the fornices.

After exudation is present, we may feel one or other of the following conditions :—

1. A flat hard non bulging condition of the fornices round the cervix, which is not displaced to one or other side but is immobile. The usual simile, and a very good one, is that it feels as if plaster of Paris had been poured into the pelvis.

2. An indistinct fulness high up in the pelvis. This may be from serous exudation.

3. A bulging tumour behind the uterus displacing it to the front; or a tense fluid laterally, apparently in the site of the broad ligament (fig. 34). The former is due to encysted serous effusion in the pouch of Douglas, the latter to encysted serous fluid behind the broad

ligament displacing it forwards. As a general rule these effusions are high in the pelvis and symmetrical. Sometimes the bulging retro-uterine tumour feels nodulated after a time; this is probably from extension of the inflammatory condition into the subjacent connective tissue.

Note that the bimanual is often impossible owing to the rigid condition of the fornices and abdominal muscles. The bimanual estimation of effusion is often misleading, owing to the fact that we feel the rigid peritoneal membrane through the fornices, and from the rigidity of the abdominal wall draw the conclusion that there is effusion between. Careful examination under chloroform is of great value in such cases.

B. Chronic Peritonitis.

Symptoms.

Symptoms. These are chiefly backache, sideache, leucorrhœa, increased and painful menstruation and sterility. Pain is the most marked symptom, and is increased on vaginal examination or coitus.

Physical Signs.

Physical Signs. On vaginal examination, obscure thickening is felt in the fornices. The uterus, if displaced, is often markedly anteverted from cicatrisation of the peritoneum in the pouch of Douglas. Very frequently it is retroverted and bound down by adhesions, which may, however, allow of a certain range of mobility.

The chronic form may occur as a sequel to the acute; most frequently it develops as the result of previous tubal and uterine diseases.

PERITONITIS A CONSERVATIVE PROCESS.

The rigidity of the muscles, exudation, and loss of intestinal peristalsis are all conservative processes. The lower seven dorsal nerves supply the abdominal skin, belly muscles, and give branches to the sympathetic, so that pressure on skin at once induces protective muscle spasm. The bowel distension and exudations increase intra-abdominal pressure, and limit the spread of mischief. Thus the inflammatory exudate with the organismal cause *may* become encysted.

DIFFERENTIAL DIAGNOSIS.

This will be considered under Cellulitis.

COURSE AND RESULTS.

Course and Results.

Very often the inflammatory condition clears up. The adhesive form leaves its mark in the shape of pathological anteversions and retroversions bound down (*v.* figs. 101, 102). The Fallopian tubes may have their ovum-conducting power so interfered with that an incurable sterility results. When they are not injured to this extent, conception may occur and the adhesions may ultimately yield to the stretching brought to bear on them by the developing uterus. They may, however, resist this and cause abortion.

Occasionally, pelvic peritonitis becomes general, and may then be rapidly fatal. We get distension of the abdomen, vomiting of a very severe type, with high pulse, 140 to 160, and often little rise of temperature; this is the form seen in septic cases, the result of infection during abdominal section.

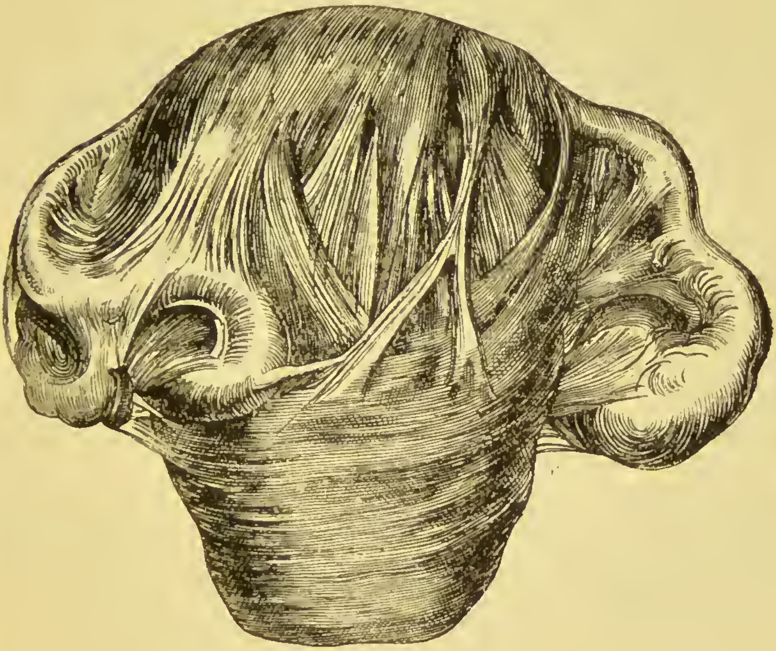

FIG. 101.

PERITONEAL BANDS binding down the Uterus, Tubes, and Ovaries—result of chronic pelvic peritonitis (*Heitzmann*).

Serous exudations may become absorbed or perforate into the bowel or vagina.

PROGNOSIS.

Each case must be judged on its own merits. We give, therefore, only general hints. Prognosis.

As to life.—Pelvic peritonitis is not usually fatal. If it becomes general and is septic in its origin, then the prognosis is very grave. A high and persistently rapid pulse, with a temperature not in the same ratio, also makes prognosis grave. We cannot too strongly impress on the practitioner the importance of pulse rate as affecting prognosis. A pulse below 100 indicates a favourable prognosis; when above 120, or when "running" the prognosis is of the most serious description.

As to sterility.—This is difficult to give, and often time alone settles the point. The mechanical closure by pressure of the Fallopian tube—a condition not diagnosable—and peri-ovaritis rendering ovulation impossible, are conditions often produced and both incurable. Prognosis as to conception should always be cautious, and never definite when the peritonitis has been extensive.

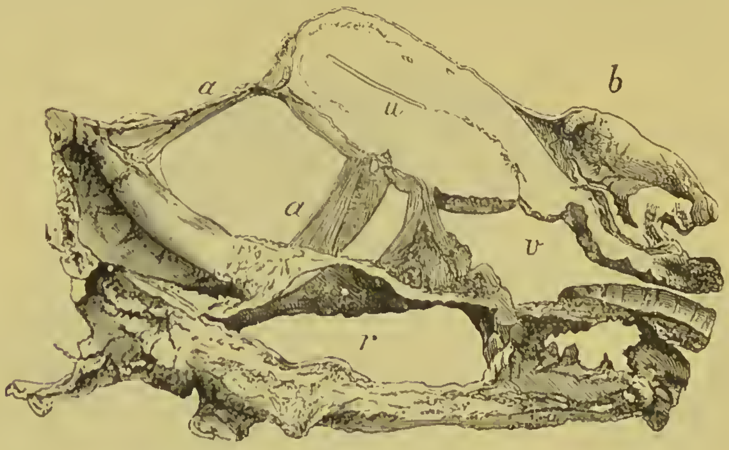

FIG. 102.

UTERUS retroverted and bound back by peritonitic adhesions (*Winckel*). *a a* adhesions; *b* bladder; *v* vagina; *u* uterus; *r* rectum ($\frac{1}{2}$).

TREATMENT.

Treat-ment.

A. Acute pelvic peritonitis—*a. Prophylactic.*
b. General.
c. Local.

Prophy-lactic Treat-ment.

a. Prophylactic.—The importance of prophylaxis cannot be overrated. In all operations the strictest antiseptic precautions, along with good operative technique, must be employed. It is attention to this that gives the operator freedom from septic mischief, and it is in this that the limiting of disease finds its best results. The dangers of the consulting-room use of the sound have been already alluded to. Care should also be taken by patients during menstruation, and it is also evident that gonorrhœa needs judicious treatment.

General Treat-ment.

b. General.—Our views as to the treatment of pelvic peritonitis have undergone considerable modification in view of our knowledge as to its etiology. Formerly, as may be well seen on consulting the earlier editions of the present work the treatment was mainly medical, although the influence of sepsis was recognised, and was moulded on a markedly antiphlogistic type. We have now, however, to consider the matter more broadly, and to take up each case on its own merits, keeping in mind the possibility of surgical interference.

In a case where no septic source is known, or where it cannot be treated surgically, the practitioner must have recourse to general treatment.

Diet.

(1.) *Diet.*—In the early stages of inflammation this should be chiefly milk, iced or mixed with aerated lime water or potash water.

Stimulants.

When the patient's strength is reduced and the pulse flagging, nutritious stimulating food must be frequently given. Milk should be still continued; but beef tea or strong soups every two or three hours must be added. Stimulants are requisite at this stage, viz., brandy, champagne, gin, or whisky. Care must be taken to give these in their stimulating doses, *e.g.*, for brandy, a table-spoonful every two or three hours.

Regulation of the Bowels.

At first 3 to 4 grains of calomel may be given as was recommended by Tait. Later, gentle aperients such as compound liquorice powder, colocynth and hyoscyamus pills, castor oil, etc., can be used; and occasional enemata are of service. Enemata should not, however, be used exclusively, as that might lead to the formation of troublesome scybala.

Tonics.

If suppuration occur, it must be treated by suitable incisions, and iron and quinine should be administered.

℞ Ferri et Quininæ Citratis	gr. lxxx.
Aquæ	℥ij.

Sig. Teaspoonful thrice daily in water.

The bitterness is best masked by dilution with water and not with orange or other syrups which derange the stomach.

Treatment of Pain.

(2.) *To alleviate pain.*—Nothing is so good for this as the hypodermic injection of morphia, but it should be avoided as long as possible, nd only small doses given. Tabloids of varying strength (gr. $\frac{1}{12}$–$\frac{1}{2}$) can be employed and atropia sulphate (gr. $\frac{1}{150}$–$\frac{1}{120}$) should be combined with it.

Chlorodyne (25 min.); extractum opii liquidum (10 min.) or laudanum (tinctura opii, 25 min.) may be used. More useful than these are morphia suppositories.

℞. Morphinæ Hydrochloratis	gr. $\frac{1}{3}$.
Fiat suppositorium.	Mitte tales vj.

Sig. As directed.

Opiates should not be used indiscriminately, as they are apt to mask symptoms. The patient cannot be allowed to suffer, however, and therefore the medical man's hand is forced in this respect.

Treatment of High Pulse and Temperature.

(3.) *To bring down pulse and temperature.*—In early stages, tincture of aconite or veratrum viride was at one time considered of great value, but is little employed now.

If the temperature keep up, quinine in 5–10 grain doses may be given. Antipyrin (10–15 grains) is useful, and relieves headache.

Local Treatment.

c. Local treatment.—Ice is not generally used as a local application in this country, but is sometimes good, although it has its disadvantages.

Of great use are large hot linseed poultices. They should be made very hot, and should be covered with a layer or two of cotton. Such a poultice will be effective for 2 or 3 hours. Blisters and turpentine stupes are good, but soon render the skin so sore that after-treatment by poultices is difficult.

The hot vaginal douche (as directed at page 139), with carbolic acid added in septic cases, should on no account be omitted.

Encysted serous collections, when bulging, as they may do sometimes in the region of the posterior fornix, should be incised from the vagina. The fluid is clear and may coagulate.

Treatment against Sepsis.

To combat any septic condition.—The first point to determine here is the existence of any source of septic absorption. When this is ascertained to be in any accessible part of the uterine or vaginal tract, prompt disinfection, with antiseptics, such as the perchloride of mercury lotion (1 in 3000 to 4000) is imperative. The tamponnade with iodoform gauze is also of great value. Of course this treatment may be, and indeed often is necessary before any distinct symptoms or signs of peritonitis exist, and where the diagnosis is merely that of septic absorption from the genital tract. When the source of infection is intraperitoneal and following operation, a very difficult question arises and one must wait till the march of events gives distinct indication for interference.

Thus in cases where the condition is pronounced, the pulse high, and the temperature not up in the same ratio, or where the peritonitis is threatening to become general, the practitioner has to face the question of having abdominal section performed. He must consider the possibility of there being a ruptured tube, a torsion, or suppuration in a small ovarian cyst. There is no doubt that in such cases the patient's only chance for life lies in the prompt performance of laparotomy, or of vaginal section (*v.* postea), followed by drainage, if necessary.

Of drugs which may be used to combat sepsis, the only one likely to prove beneficial is antistreptococcic serum, fuller reference to which will be made later (page 183).

The treatment of suppuration will be considered at p. 182.

The modern standpoint as to the treatment of pelvic peritonitis may be summed up as follows. Ascertain the source of the mischief and deal with it by local disinfection or by surgical means when possible. Use palliative treatment carefully, and be especially cautious in regard to opiates; when one dose has lost its effect, the question of further administration must be very carefully considered.

Treatment when Chronic

B. Treatment of chronic pelvic peritonitis.—When adhesions are extensive, and tubal disease present, the question of abdominal section has to be considered. When the uterus is retroverted and fixed by adhesions, the displacement will in all probability be permanent. Bimanual manipulation and massage have been recommended to break down adhesions or cause their absorption, but they are difficult to carry out. Laparotomy may also be done—see the Treatment of Retroversion of the Uterus.

Since our knowledge of the nature of tubercle has been rendered more exact by Koch's discovery of the tubercle bacillus, *tuberculous* peritonitis has been found to be by no means rare; and the bacillus tuberculosis has now been discovered, though sparingly and usually in giant cells, by several observers. We may also have *malignant* peritonitis, due usually to rupture of papillomatous ovarian cysts. In both the tuberculous and the malignant form we get ascitic fluid.

TUBERCULOUS PERITONITIS.

LITERATURE. *Hegar*—Die Entstehung, Diagnose und chirurgische Behandlung der Genitaltuberculose des Weibes: Stuttgart, Enke, 1886. *Kelly, H. A.*—Operative Gynecology: Kimpton, London, 1898, Vol. II., p. 134. *Poten*—Ein Fall geheilter Bauchfelltuberculose: Cent. für. Gyn., 1887, S. 33. *Schwarz*—Ueber die palliative Incision bei Peritonitis tuberculosa: Wien. Med. Wochens., No. 13, 1887. *Tait, Lawson*—Diseases of the Ovaries, fourth edit., p. 334: Birmingham, 1883. *Wells. Sir T. S.*—Ovarian and Uterine Tumours, p. 100: Churchill, London, 1882. *Williams, J. Whitridge*—Tuberculosis of the Female Generative Organs: John Hopkins' Reports, III., p. 85.

Preliminary Remarks.—The serious results of tuberculous disease of the lungs, meninges, and mucous tracts render the comparatively good prognosis in tuberculous peritonitis as remarkable as it is at present inexplicable. In Wells' historical case in 1862, abdominal section was performed for ascites due to peritoneal tuberculosis, miliary tubercles were found studding the bowel surface; and yet, as the result of the section and evacuation of fluid only, complete recovery took place, the patient being well nineteen years afterwards (1881). Since then, equally good results have been obtained by others.

Pathological Anatomy.—The condition may exist as miliary tubercle, acute or in a caseous ulcerating condition; or as chronic fibro-tuberculosis.

Symptoms.

Symptoms.—It is remarkable that this condition may be latent, and may be only discovered by accident. The distension of the abdomen is often the only condition which strikes the patient's attention, and for which she seeks advice. The temperature in many cases will be found to have an evening rise, but this is by no means constant. When present, it is of great value in differential diagnosis. Kelly mentions that the development of tuberculosis is occasionally related to a previous confinement, that the average age of his 29 cases was 27·5 years, and that pain in urination was a frequent symptom.

The patient's general health may be good, although some have a hectic look, with no rise of temperature if the peritoneum alone is affected. It must be kept in mind, however, that the lungs may be simultaneously implicated. There is often persistent abdominal pain, pain on micturition, and flatulent distension.

Physical Signs.—We may have fluid in the abdomen so encysted as to simulate ovarian cyst, or there may be free fluid but with impaired mobility and with irregular lumps, due to matting of bowels and omentum.

Differential Diagnosis.

The *Differential Diagnosis*, which is chiefly from typhoid fever, ovarian cyst, and malignant peritonitis, is difficult, and may be cleared up only by exploratory incision. The following hints are useful. Typhoid can be excluded by Widal's reaction. Kelly points out that we may see the fine lines of the intestinal adhesions, and start peristalsis by a smart finger-tap. The lungs should always be carefully examined, as tuberculous disease there may coexist.

Treatment.

Treatment.—Abdominal section, with evacuation of fluid, may be all that is requisite; the use of antiseptic irrigations or the application of iodoform to the peritoneum before the wound is closed has been found unnecessary, and the same may be said, as a rule, of drainage. Some operators remove the uterus and appendages when involved, as they often are; when drainage is necessary, a lightly packed iodoform gauze strip may be used. Care must be taken during operation not to tear into bowel. In 17 cases collected by Schwarz, the general age was seventeen to thirty-three; youngest, four; oldest, fifty-seven. Immunity was found in these to range from two to ten years, but one case of complete cure has been recorded by Wells. A phthisical condition of lung, if not too far advanced, is not a contra-indication.

When no fluid, or only a matted condition, is present, or where the masses are solid, linimentum hydrargyri may be freely applied to the skin of the abdomen and the patient put under favourable general conditions—viz., dry hill air and abundant use of fattening food, the value of the open-air treatment in all cases of tuberculosis being now recognised.

MALIGNANT PERITONITIS.

Etiology.

This is, in the majority of cases, secondary to malignant disease in some other part of the abdomen or pelvis. The commonest pelvic causes are malignant disease of the ovaries (cancer) and rupture of papillomatous ovarian cysts.

The peritoneum is invaded by numerous papillomatous hard whitish nodules, and ascites is present, the fluid generally being blood-stained. As the disease progresses, large cancerous masses may develop in the omentum and mesenteric glands, which may cause death by constricting the intestine.

Symptoms.

Symptoms.—In the early stages these are obscure. The patient is not at first cachectic, and the only thing attracting attention is the distension of the abdomen by fluid. Later cachexia, more or less jaundice, and great wasting, along with the pronounced ascites, are the chief symptoms. Death usually results from exhaustion, and may be delayed from three to four years. In other cases intestinal obstruction or extension to the pleura or pericardium hasten the fatal termination.

Physical Signs.

The *Physical Signs* are abdominal distension, irregularly encysted fluid, irregular masses felt in the abdominal cavity on palpation, with, occasionally, secondary nodules in the pelvic or iliac glands, and sometimes characteristic cell groups in the fluid drawn off. Diagnosis is not always easy. Here, as in all abdominal cases, it is important to have the bowels thoroughly cleared out. The nodules can sometimes only be felt after the fluid has been withdrawn by tapping. The diagnosis is sometimes only certain on abdominal section.

Treatment.

Treatment.—All that can be done is to draw off the ascitic fluid from time to time when the abdominal distension becomes so great as to cause pain or interfere seriously with respiration. Southey's tubes are a safe and convenient means of tapping the abdomen.

PELVIC CELLULITIS (PARAMETRITIS).

Pelvic Cellulitis.

SYNONYM.—Parametritis, a term sometimes limited to inflammation of the cellular tissue round the cervix and upper part of vagina —Virchow's parametric tissue. At the close of this chapter we shall have to notice specially a variety of this described by W. A. Freund as *Parametritis chronica atrophicans circumscripta et diffusa.*

NATURE.—An acute or chronic inflammatory affection, usually septic, affecting the cellular tissue of the pelvis.

PATHOLOGICAL ANATOMY AND VARIETIES.

Pathological Anatomy and Varieties.

It is the rare exception to examine a multiparous female pelvis without finding some trace of a previous cellulitis or peritonitis. Thus split cervix, so common in women who have borne children, is often associated with some cellulitis at the base of the broad ligaments. The uterus is rarely central, but is often drawn to the one side by the cicatrisation of some previous lateral cellulitic inflammation of the broad ligament; the traction may even be so great that it lies at right angles to its proper axis. We have seen that the utero-sacral ligaments are peritoneal folds containing connective tissue and unstriped muscular fibre. Inflammatory attacks in one or both of these folds (combined pelvic peritonitis and pelvic cellulitis) are very common. Schultze calls this "parametritis posterior," but utero-sacral cellulitis is a more accurate term. The cicatrisation of these ligaments after such inflammation, causing traction just above the isthmus, brings about the most common cause of dysmenorrhœa and sterility—pathological anteflexion of the uterus (*v.* Anteflexion of the Uterus). It is evident that in this way, too, we get the uterus anteflexed and drawn to one side, or anteflexed and drawn back (fig. 77).

Sometimes pelvic abscesses are found in localities to be afterwards alluded to. Often the uterus and ovaries are in an atrophic condition owing to compression of the vessels and nerves by the cellulitic exudation; this quite agrees with the clinical fact that many women with bad pathological anteflexion do not suffer much at their periods, because the withered condition of the organs produces scanty menstruation. According to some, we can have no cellulitis in the broad ligaments and no formation of pus—abscess of the broad ligaments. Clinical, anatomical, and pathological evidence is in favour of the occurrence of both. At the same time, it is almost impossible clinically to distinguish abscess of the broad ligament from an encysted serous pelvic peritonitis, or in some cases from a distended adherent tube.

ETIOLOGY.

Etiology.

In *parous women* the great cause of pelvic cellulitis is septic matter (*i.e.*, either cocci or bacilli, or their products) absorbed by the lymphatics usually from the torn vagina or cervix. This passes along the abundant lymphatics and blood-vessels in the cellular tissue beneath and in the broad ligaments, causing inflammation of the glands and proliferation of the connective tissue in which these are embedded. Thus we find *childbirth*, *premature labour*, and *abortion* often followed by cellulitic attacks for obvious reasons. In parturition we have the cervix, for instance, torn vertically at one side; and septic matter deposited there often speedily spreads along the lymphatic stream (*v.* page 68). So far as we have considered the etiology of pelvic inflammatory affections, we have associated them with some virus, most frequently septic. We do not believe that mere traumatic injury, apart from septicity and tension, can cause an inflammatory attack.

In *nulliparæ*, cellulitis may result from septic absorption, from the cervical canal or rectum. A chill during menstruation (see causes of pelvic peritonitis, page 167) probably acts by favouring this.

Pelvic peritonitis, in a minor degree, is always associated with cellulitis as already mentioned.

SYMPTOMS.

Symptoms.

The patient has a rigor or chill. Pain is felt over the lower part of the abdomen, but it is not so intense as in peritonitis. The pulse and temperature are raised, the pulse being lower and the temperature higher, than in pelvic peritonitis. After exudation has taken place the patient may have one thigh alone drawn up.

PHYSICAL SIGNS.

Physical Signs.

There is pain on palpation of the abdomen; and after exudation has taken place, we feel a fulness at one side of the uterus or in the iliac fossa.

Bimanual examination, always difficult, reveals at first nothing but increased heat and tenderness. After exudation has occurred, it is found in the following positions:—

(1.) As a bulging at the side of the uterus, depressing the lateral fornix and pushing the uterus usually to the other side;
(2.) In the upper portion of the broad ligament, and therefore not bulging downwards;
(3.) In the iliac fossa;
(4.) Very rarely, behind the uterus;
(5.) Still more rarely, between uterus and bladder.

We have seen pus pointing in the inguinal region on one side, and with no dipping down into the pelvis or immediate connection with the side of the uterus. The intermediate deposit had cleared away, or it may be that the parametritis was remote from the uterus. When pus is present in large amount, the fluctuation can be felt bimanually. When it forms in the centre of a large inflammatory exudation, an obscure boggy feeling may or may not be made out. Aspiration prior to evacuation may help here very much. But it is better to incise where, from the fact that there is an evening rise of temperature with occasional rigors and sweatings, pus is diagnosed.

Leucocytosis.

In doubtful cases the value of an estimation of the number of leucocytes in the blood should be kept in mind. The number normally present varies from 7000 to 8000 per cubic millimeter. When there is any septic process going on, resulting in pus formation, this number is, as a rule, much increased — the increase affecting chiefly the polynuclear neutrophile cells. A leucocytosis of 15,000 or over in a case of pelvic inflammation generally indicates the presence of pus. Absolute reliance cannot however be placed on a blood examination, as there may be a marked leucocytosis without pus, and *vice versâ*; it must therefore only be used as an adjunct to the other methods of investigation. There is no leucocytosis in cases of sterile or in tuberculous abscess.

Explanation of course of Exudations.

The course of these exudations, inflammatory and purulent, is explained in two ways.

(*a.*) By the course of the lymphatics, which run, as we have seen, from the uterus outwards beneath and between the layers of the broad ligament to the glands in the lumbar region.

(*b.*) By the lines of cleavage in the cellular tissue of the pelvis. The student should refer back to the description of cellular tissue of the pelvis given in Chap. II., and especially to König's researches (page 45). Based on these, and on clinical work, König holds that—

(1.) An exudation in the broad ligament, near the tube and ovary, passes first along the psoas and iliacus and then sinks into the true pelvis;

(2.) Exudations which begin primarily in the deeper cellular tissue on the antero-lateral aspect of the cervix, pass first to the cellular tissue of the true pelvis at the side of the uterus and bladder, then along the round ligament to Poupart's ligament beneath the inguinal canal, and finally outwards and backwards into the iliac fossa;

(3.) Abscesses, developing from the posterior aspect of the broad ligaments, fill first the postero-lateral part of the pelvis and then pass as in (1.).

DIFFERENCES AND DIFFERENTIAL DIAGNOSIS BETWEEN ACUTE PELVIC PERITONITIS AND CELLULITIS.

Differences and Differential Diagnosis.

Differences.

Pelvic Peritonitis.	*Pelvic Cellulitis.*
(1.) Inflammatory affection of pelvic peritoneum chiefly.	(1.) Inflammatory affection of pelvic cellular tissue chiefly.
(2.) Usually general, round the uterus.	(2.) Usually lateral.

Differential Diagnosis.

Pelvic Peritonitis.	*Pelvic Cellulitis.*
(1.) Patient's legs drawn up on both sides.	(1.) Usually only one leg drawn up.
(2.) Firm flat effusion not bulging into fornices, and situated round the uterus; or a mesial bulging of serous effusion behind uterus. Cervix (vaginal portion) is of normal length.	(2.) Firm effusion, bulging usually into fornix of one side. Thus cervix (vaginal portion) apparently shortened on one side.
(3.) Does not spread along round ligament or into iliac fossa, but may affect all peritoneum.	(3.) Exudation or pus spreads in definite directions, and is usually localised.
(4.) Uterus displaced to front, or unaltered in position.	(4.) Uterus usually displaced to one side.

It is often very difficult to differentiate these; and therefore in some cases the diagnosis must be pelvic inflammation—probably cellulitic or peritonitic or tubal, as the case may be.

COURSE AND RESULTS.

Course and Results.

Very often the attack passes off and leaves no trace. The septic poison is too small in amount to do harm; or it sets up some inflammatory exudation, which mechanically arrests progress, and then becomes absorbed. The vitality or health of the tissues and the strength of the poison have also their share in determining its progress. Exudation may take place and may be absorbed almost completely, may suppurate slowly, and only to a limited extent, or may form a large abscess. This abscess may open into the bowel or bladder, or pass below Poupart's ligament, or upwards beneath the kidney. Rarely does it appear in the perineum, or pass through the sciatic notch to the buttock. In one case where the last occurred, the patient complained of a very deep-seated pain just over the notch.

It is valuable to note how rarely the abscess perforates into the peritoneal cavity. The peritoneal surfaces of the abdominal contents are in contact; and as the inflammatory attack spreads, it sets up a peritonitis which glues the adjacent surfaces together. When septic pus does enter the peritoneal cavity, it sets up a rapidly fatal peritonitis.

PROGNOSIS.

Prognosis.

This depends on the extent of the inflammatory attack, and its effect on the patient's health. Its septic origin usually causes anxiety; but it does not spread so rapidly as peritonitis. Resolution of inflammatory deposits is slow. Pathological anteflexion gives rise to troublesome dysmenorrhœa and sterility. Prognosis should always be guarded as to complete recovery.

TREATMENT.

Treatment.

The general and the local treatment are exactly the same as in pelvic peritonitis. The occurrence of suppuration is indicated by rigors and an increasing leucocytosis, and should be hastened by the hot douche and poultices. We may have only part or parts of the exudation suppurating, so that in a cellulitic swelling we may have inflammatory exudation containing separate abscess cavities. Within the past few years, as the result of the work of Péan and his pupils, especially Ségond, Hysterectomy has been practised in cases of pelvic suppuration around the cervix. The results have been good, and there is no doubt the use of this method of interference will increase.

Treatment of Pelvic Abscess.

When pus is present in large quantity, the treatment varies according to the part at which it points.

(1.) If it point above or below Poupart's ligament, in the buttock, or behind the kidney, it is to be opened with antiseptic precautions, and a drainage tube inserted. Results by this method are admirable.

(2.) When bulging in the posterior fornix, the pus may be evacuated in the following way. With the patient in the lithotomy posture and the use of all antiseptic precautions, a duckbill speculum is passed and the cervix fixed and drawn forward with a volsella. The operator, keeping one finger of the left hand in the rectum so as to guard against injuring it, may plunge a pair of sharp-pointed scissors through the part bulging into the posterior fornix, and then open them up from side to side. Or he may first incise the mucous membrane transversely with a knife, and with the upper hand pressing down the mass from above, a pair of sinus forceps may be pushed in and opened up when they reach the pus.

The cavity may be stuffed with iodoform gauze, and a tube, if necessary, substituted afterwards if the cavity requires washing out.

According to the position of the bulging the operator may make an incision with the knife in the anterior fornix (rare) or in the lateral fornix. In the former instance he speedily reaches the loose tissue in front of the cervix, and gets into the abscess cavity, care being taken not to injure the bladder. In the case of the lateral fornix the relation of the ureter and uterine artery must be kept in mind (*v.* fig. 28).

The drainage tube should have a small piece at the end at right angles which prevents it slipping out. It should not be perforated where it lies in the vagina, as this prevents the washing out. Straight tubes can be fastened with a stitch to the edge of the incision.

If in abdominal section a pelvic abscess is found, it is best to close the abdomen and open it *per vaginam*, or, at anyrate, to establish a free drain through the vagina.

The practitioner will very often find the remains of cellulitis as an indistinct thickening in the fornices. For these, blisters in the iliac regions, the glycerine plug, and hot douche, are useful (*v.* under Chronic Ovaritis).

TREATMENT OF SEPTIC CONDITIONS BY ANTITOXINES.

In a patient who has septic organisms in the tissues of the genital tract we get a formation of toxines, and by the absorption of these she becomes poisoned, and ultimately may succumb. No one can see a case of septicæmia after an abdominal section or abortion without feeling that the patient is under the influence of a cardiac poison. In a case likely to be fatal the pulse rises to 120, goes on to 140, begins to flag and become irregular; and when this irregularity comes on, the end is not far off. The student now understands that in inflammatory affections of the tubes and ovaries, of the peritoneum and cellular tissue, cocci and bacilli play an essential part; that in fact, they are the cause of the infection in the septic group of these conditions. The question of treatment of such causes naturally arises, and hitherto that has been most successful in the way of prevention (*v.* Chapter XV. on Antisepsis, etc.).

The remarkable researches of Löffler, Behring, Roux, S. Martin, and others, have shown that diphtheria is due to the presence of a bacillus, and that it secretes a poisonous albumose or toxine. This toxine can be obtained from pure cultures of the bacillus, and when injected hypodermically into the horse, there can be obtained from the serum of its blood after a time, an antitoxine which neutralizes the toxine. We give only the barest outline of this as it does not belong to our subject. The special application comes now.

We have seen that the streptococcus pyogenes is often the organism of sepsis, and it is of the greatest importance to ascertain if a toxine is produced by it, and if an antitoxine or anti-streptococcic serum can be obtained as in the case of diphtheria. This has been accomplished by Marmorek, who obtained toxines from cultivations of streptococci, and also, by injecting this toxine into the donkey, an anti-streptococcic serum from its blood.

We have thus reached a most important stage in the treatment of septic conditions, and may put the matter thus. In a patient with septicæmia the condition is probably due to a local development of streptococci which are secreting toxines, and poisoning the patient. We say "probably due to a local development of *Streptococci*" as other

Antistreptococcic Serum.

micro-organisms, notably staphylococci and the bacterium coli commune may be the cause of the blood poisoning, and against them the anti-streptococcic serum is inert. It should thus only be used in streptococcic infections, and for the determination of this a culture must be made from the infective secretion (*v.* p. 161). The treatment and cure of such a case must therefore not only be by local disinfection (*v.* Chapter XV.) and general treatment, but we may attempt to neutralize the toxine and kill the organism by the hypodermic injection of the anti-streptococcic serum. The various antitoxine serums can now be had from most of the leading chemists. A special syringe is necessary, one that can be taken to pieces and rendered thoroughly aseptic by boiling. The serum is usually injected into the loose subcutaneous tissue of the anterior abdominal wall. Before doing so the skin at the place of puncture must be thoroughly disinfected. If the serum used requires a dose of more than 25 cc., it is advisable to make more than one injection. The operation causes little or no pain, provided the point of the needle is introduced *through* the skin into the loose cellular tissue beyond. 10 cc. is an average dose, but the amount will depend on the preparation used. These serums have no injurious action on the patient, and the dose can be frequently repeated. There is sometimes marked reduction of pulse and temperature; opinions are discordant, however, as to its value.[1] Its use, at anyrate, does no harm, and it is worthy of further trial.

EFFECTS OF PELVIC PERITONITIS AND CELLULITIS ON THE UTERUS.

Effects of Peritonitis and Cellulitis on the Uterus.

It is unfortunate that uterine displacements have of late years bulked so largely in gynecology—we mean by this that many regard a uterine displacement in itself as a condition sufficient to account for symptoms of bearing down pain, leucorrhœa, or even for sterility and dysmenorrhœa. It is a well-ascertained fact that uterine displacements are in many cases the result of antecedent peritonitis or cellulitis, are mere physical signs of these affections, and therefore secondary lesions of far less importance than the pelvic inflammation which was the primary one.

These displacements might be grouped under the two heads :—

A. those caused by Pelvic Peritonitis;
B. those caused by Pelvic Cellulitis.

A. *Displacements caused by Pelvic Peritonitis.*

Displacements from Peritonitis.

From the lymph effused and the resultant bands formed in pelvic peritonitis, the uterus becomes bound to the adjacent peritoneum on the rectum (retroversion and retroposition); or more rarely, to that on the bladder (anteversion); sometimes it is twisted on its long axis or matted to the coils of intestine surrounding it. Figs. 101, 102, 103, illustrate these conditions.

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[1] See report on the value of Antistreptococcic Serum in the Treatment of Puerperal Septicæmia. Am. Gyn. Tr., 1899.

The *Diagnosis* of such adhesions is made by digital pressure through the rectum in the case of retroversion, and through the anterior fornix in anteversion. In the former case, the immobility of the uterus is felt; and when pushed up so as to be manipulated by the abdominal hand, replacement is found to be impossible; or if partially successful, the displacement returns almost immediately. Sometimes the retroverted uterus when not adherent is replaced with difficulty, owing to the cohesion of the peritoneum on the posterior uterine surface with the peritoneum behind it, and this point has to be borne in mind. The sound should certainly not be employed in cases with adhesions, as, by its leverage, vascular adhesions may be torn, and hæmorrhage produce hæmatocele with subsequent pelvic peritonitis.

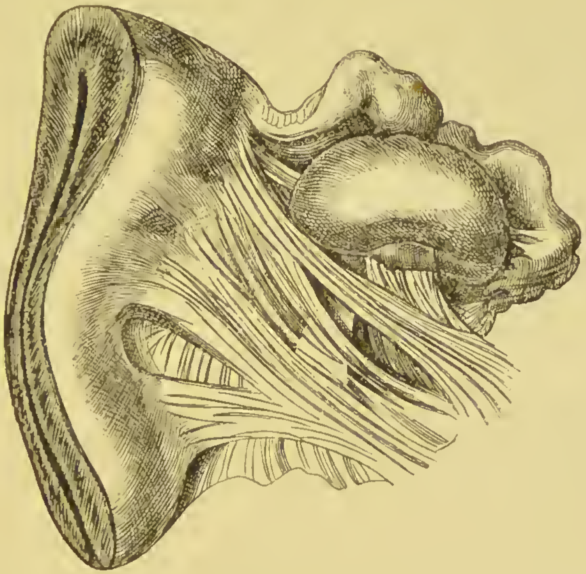

Fig. 103.
Peritonitic Adhesions drawing the Uterus to one Side (*Heitzmann*).

B. *Displacements caused by Pelvic Cellulitis.*

Lateriversion.

These are two in number: viz. (*a.*) Lateriversion; and (*b.*) Pathological Anteflexion due to Utero-sacral Cellulitis.

(*a.*) *Lateriversion* is the result of cellulitis in one broad ligament, subsequent absorption of the inflammatory effusion, and cicatrisation of the ligament. The *Diagnosis* of this condition is easy. There is often a split of the cervix at the side corresponding to the displacement as well as scarring in the fornix with coincident displacement of the cervix. Bimanually, the uterus is felt drawn to the one side, fixed, and sometimes the body is lateriflexed as it were on the cervix. Bimanual displacement of the uterus to the non-affected side causes pain. The pathology of this displacement in many cases is that cellulitis, probably septic, has spread after parturition from the split cervix along the lymphatics perhaps at the base of, and in the broad ligament; effusion of lymph and formation of pus has followed; finally, there result the incomplete resolution and cicatrisation already mentioned.

Pathological Anteflexion.

(*b.*) *Pathological Anteflexion due to Utero-sacral Cellulitis* is one of the most important, most intractable, and most misunderstood of lesions. Its nature may be thus described. A cellulitis, in or in the neighbourhood of the utero-sacral ligaments, has gone on to cicatrisation—producing fixation of the uterus and, along with the action of intra-abdominal pressure, anteflexion (*v.* Chap. XXXIII. Displacements of the Uterus). This cellulitis is often the result of abortion, more rarely of full-time parturition; it is frequently found in nulliparæ, and may in some cases be due to the zymotic diseases of childhood.

This condition is *diagnosed* as follows: on vaginal examination, the cervix is found high up, because drawn back, and pointing usually downwards and forwards; through the anterior fornix the body of the uterus is felt. Bimanually, the uterus is recognised as anteflexed (*see* under Anteflexion). Through the posterior fornix we feel thickening and fixation of the tissue in the neighbourhood of the utero-sacral ligaments, or we may sometimes feel the thickened ligaments themselves running in a direction forwards and inwards. The rectal examination gives valuable information, as the thickening is more distinctly felt, the anteflexion is more accurately mapped out and ovaritis or other inflammatory thickening discovered.

The amount of fixation should be estimated by bimanual movement of the uterus, as this helps in prognosis. Often the cellulitis affects one side of the parametric tissue and gives a displacement of the uterus towards the posterior extremity of an oblique diameter of the pelvis.

We shall have again to consider the symptoms and treatment of these conditions in the chapter on Displacements of the Uterus. From what has been said, however, it will be evident that their treatment should be at first that of chronic peritonitis and cellulitis.

PARAMETRITIS CHRONICA ATROPHICANS.

Parametritis Chronica Atrophicans.

We have already described some of the results of acute pelvic peritonitis and cellulitis in causing pathological retroversions and anteflexions. W. A. Freund of Strassburg has drawn attention to a condition of the pelvic connective tissue, similar in some of its results, but differing from what we have described in not having an acute stage. He terms it *Parametritis Chronica Atrophicans Circumscripta et Diffusa.* His researches are very valuable and explain results usually ascribed to mere displacements of the uterus or the pathological condition of the cervix; they also give a basis for treatment or at least show the futility of much of the mechanical treatment by pessaries.

a. Parametritis Chronica Atrophicans Circumscripta.

Nature.—A circumscribed chronic inflammatory process affecting chiefly the fascial and aponeurotic thickenings of the fatless connective tissue, and causing changes analogous to those in cirrhosis of the liver, kidney, and spleen.

Etiology.—The primary cause may lie in bladder, rectum, or uterus. When in the bladder, there has been some ulcerative process from which irritation has passed causing paracystitis chronica atrophicans (inflammation of the connective tissue near the bladder). From the side of the bladder, thickenings in the connective tissue pass outward and forward and by their ultimate atrophy bring about uterine displacement in the opposite direction: thus, left paracystitis will cause retro-dextro-flexion of the uterus, while right paracystitis will bring about retro-sinistro-flexion.

In the rectum, the starting-point may be dysenteric or simple follicular ulceration at the level usually of the anterior fold of mucous membrane forming part of the sphincter tertius. The cellulitic irritation runs in the utero sacral ligaments and causes pathological ante-flexion. This effect of rectal disease has not been sufficiently recognised in this country and is worthy of clinical and pathological investigation.

Freund records two interesting *post-mortems* of chlorotic women 19 and 23 years of age respectively: the heart, large arteries, and kidneys were hypoplastic (*i.e.*, insufficiently developed); the ovaries were small and cystic; chronic pelvic peritonitis was present in Douglas' pouch; and finally, there was follicular ulceration above the sphincter tertius, and chronic paraproctitis (chronic inflammation of the connective tissue near the rectum) with shortening of utero-sacral ligaments.

In the uterus, split cervix is one great cause; we have, radiating from the split, chronic thickening running along the base of the broad ligament behind the cervix and down to the fornix. By the atrophy and cicatrisation of these chronic inflammatory thickenings, there result, ultimately, displacements of the uterus, compression of the veins, and therefore catarrh of the cervix with reflex pains due to alterations in the sympathetic filaments distributed in the connective tissue.

In *diagnosis*, careful examination (vaginal, rectal, and bimanual) reveals the thickening due to the chronic parametritis, and the consequent displacement; the initial lesion in bladder, rectum, or uterus, may be made out.

b. Parametritis Chronica Atrophicans Diffusa.

We have here a condition whose pathology is not so evident as that of the circumscribed form. It is said to begin in the base of the broad ligaments and to pass out to the pelvic walls. Ultimately, the whole pelvic tissue becomes dense, the veins partly narrowed and partly dilated, the arteries contracted and the ureters distorted. Hyperæmia of the urethra, the neck of the bladder, and rectum, is present, causing catarrh; while the uterus, at first enlarged and catarrhal, finally atrophies; the Fallopian tubes and ovaries also become atrophied; the vagina is shortened and the external genitals withered.

On microscopic examination, perineuritis of the sympathetic plexuses in the connective tissue has been found (H. W. Freund). The *etiology* is obscure. It may be due to sexual excess or frequent child-bearing and excessive suckling in women with hypoplasia of the genital organs and blood vessels.

Diagnosis is based on careful bimanual examination and determination of the changes above described, with attention to the history and carefully noting the conditions of menstruation (at first profuse and painful, and then scanty), as well as the catarrhal processes going on in the bladder, cervix uteri, and rectum.

Reflex disturbances in Parametritis Atrophicans.

Reflex disturbances arise from both varieties of Parametritis Atrophicans, due to the changes (from inflammation and pressure) in the sympathetic filaments. We may speak of these as Sympathetic, Spinal, and Cerebral Hysteria.

In the Sympathetic form, we have neuralgia of the stomach and intestines, aching kidneys, vesical pains, palpitation of the heart, and disturbances of the respiration.

In the Spinal group, there are painful spots over the spinous processes of the cervical, dorsal, and lumbar vertebræ; the pains may radiate laterally and we may get pains in the extremities. Hysterical paralysis may ultimately develop.

In the Cerebral group, there is neuralgia of the fifth nerve, hemicrania, and fixed boring pains.

The *Prognosis* is fairly good in the circumscribed form but not hopeful in the diffuse.

Treatment.—In the circumscribed form, the cause (in bladder, rectum, or cervix) must, when possible, be treated. The vaginal hot douche and bimanual massage to set up absorption and perhaps stretch nerve filaments (as in Nussbaum's nerve-stretching for sciatica) have done good. The influence of stitching cervical lacerations (Emmet's operation) may be beneficial.

The uselessness of treatment by pessaries of the uterine displacements caused by inflammation is evident.

In the diffuse form and when nervous symptoms arise, we must rely on nervous remedies, chiefly bromide of potassium. For the neuralgia, the constant current and systematic massage may be tried ; and, for the paralysis, the interrupted current. The patients ultimately get well, but it is a question of years.

CHAPTER XVIII.

PELVIC HÆMATOCELE AND HÆMATOMA: NEW GROWTHS IN THE PELVIC PERITONEUM AND CONNECTIVE TISSUE.

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PELVIC HÆMATOCELE AND HÆMATOMA.

Preliminaries.

Preliminary Considerations.—The abundant venous supply of the pelvic organs, the congestion induced by menstruation, the hæmorrhage accompanying the monthly rupture of the Graafian follicle, and especially the rupture of an early extra-uterine gestation, render women peculiarly liable to hæmorrhages into the pelvic cavity. Yet it is astonishing that it is only since 1850 that this subject has really attracted gynecologists' attention. It was in that year that Nélaton gave the subject due prominence; although Recamier (1831), Bourdon, Velpeau, and Bernutz had all recorded cases—under such titles as "Bloodgush from an aneurism of the ovary," "Blood cysts of the pelvic cavity." Nélaton had diagnosed his case as an abscess, and opened it with a bistoury; the blood and blood clots escaping from the incision showed its real nature unmistakably. Since that time pelvic hæmatocele has taken its place in Gynecology as a serious and important *symptom.*

Terminology.—The hæmorrhage is either intra-peritoneal or extra-peritoneal, but both forms may be present. The terminology is at present unsettled. "Hæmatocele" *means* "hæmorrhage *into the peritoneal cavity,*" but we may use the phrase "pelvic hæmatocele" as including both varieties, and add "intra-peritoneal" or "extra-peritoneal" where the diagnosis can be made. "Hæmatoma" is sometimes used instead of "extra-peritoneal hæmatocele." "Retro-uterine" hæmatocele is employed when the bulging is distinctly behind the uterus.

In the description of specimens, the terms peritubal and paratubal hæmatocele are also used. In the former there is a spherical tumour with a capsule, in which the fimbriated end of the tube is embedded; called also solitary hæmatocele. In the latter the blood effusion is at the side of the tube, due to rupture of an ectopic gestation.

NATURE.—*An effusion of blood into the pelvic peritoneum or connective tissue.*

Pelvic hæmatocele is thus not a disease. It is only a symptom of some previously existing pathological condition of the pelvic organs, just as hæmoptysis is not a disease but usually a symptom of some lung condition.

PATHOLOGICAL ANATOMY.

Pathological Anatomy.

Recent work in abdominal section has shown that the chief cause of pelvic hæmatocele and hæmatoma is some disturbance in the development of an ectopic gestation, and this has profoundly modified our pathological knowledge of the subject. The whole question of extra-uterine gestation belongs more properly to obstetric pathology, but certain features of the most common variety, tubal gestation, fall to be considered here. When such a gestation forms, it may begin to develop in the interstitial part of the tube, in the isthmus, in the ampulla, or between the tube and ovary; of these the ampullary form is the most common. Tubal gestation is very liable to disturbances, resulting in hæmorrhage into the tube or pelvic cavity; of these we must more especially consider the latter. As the gestation develops we may get: (1) A tubal mole forming with the ostium abdominale tubæ patent; (2) A tubal abortion; (3) A perforation of the tube through its peritoneal wall; (4) A development or rupture between the

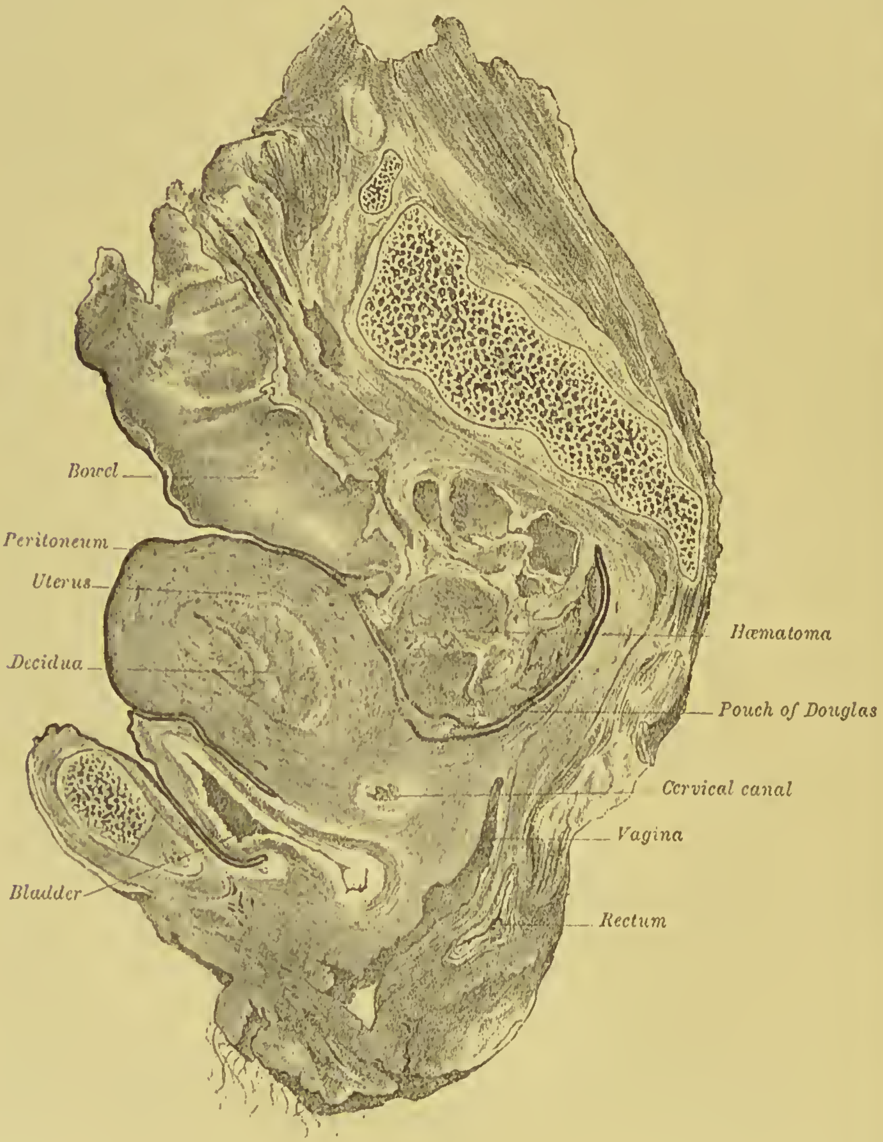

FIG. 104.

HÆMATOMA FELT AS A RETRO-UTERINE TUMOUR IN CASE OF EXTRA-UTERINE GESTATION IN RIGHT BROAD LIGAMENT (*Hart and Carter*).

layers of the broad ligament. These accidents usually occur during the first two months of gestation, and they result in intra-peritoneal hæmatocele (1–3) or hæmatoma (4).

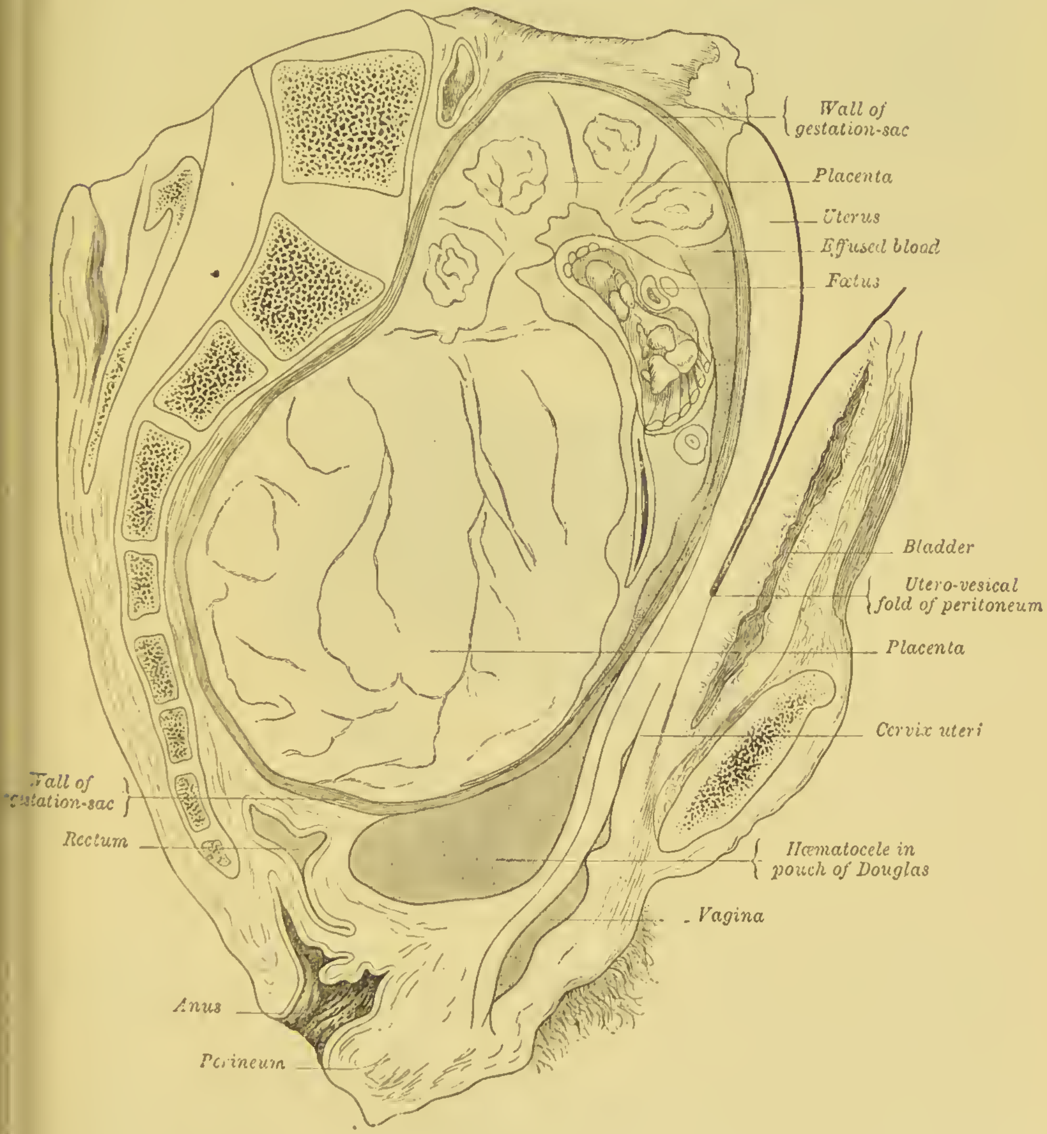

FIG. 105

RECENT HÆMATOCELE IN POUCH OF DOUGLAS from rupture of a gestation-sac lying in it; the uterus, the cavity of which is not cut into, is closely incorporated with anterior wall of sac (*Barbour*).

1. *A tubal mole with the ostium abdominale patent.*—Here, as Sutton pointed out, we get hæmorrhage between the amnion and chorion, so that a fleshy mole results, varying in size from about one to three inches in diameter. The blood within the chorion is fœtal, but in the blood mass outside this, it is maternal. Blood is effused into the tube, and

Varieties of Tubal Pregnancy.

when the ostium abdominale is patent, drips or pours into the peritoneal cavity, where it may form a peritubal hæmatocele.

2. *Tubal abortion.*—Here we have a mole formed which may be expelled through the ostium abdominale and out of the tube completely, or be arrested in it. Blood also escapes into the peritoneal cavity (figs. 106, 107). The old explanation of this was regurgitation of menstrual blood along the tube (Bernutz and Goupil, Imlach). Sutton and Werth first showed its real nature, but Imlach mentioned the "clot" in the ostium abdominale in 1886.

3. *Perforation of the tube through its peritoneal wall.*—The developing ovum has in the tips of its villi a phagocytic power, and it can thus penetrate the tube wall, eroding the venous sinuses and setting up haemorrhage in this way. Füth, Heinsius, and Andrews[1] have shown, in interesting sections of the tube, that the gestation lay embedded in the muscular coat.

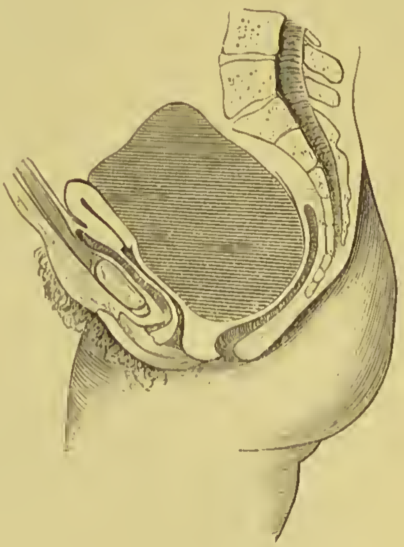

FIG. 106.

RETRO-UTERINE HÆMATOCELE. Pouch of Douglas not previously obliterated (*Schroeder*).

4. *A development or rupture between the layers of the broad ligament.*—There may be a hæmatoma in connection with an early ectopic gestation, the effused blood separating the layers of the broad ligament without rupturing them, and thus forming a lateral mass with its top at the level of the brim, and filling in great part a lateral half of the pelvis (fig. 104).

A case of ovarian gestation, described by Van Tussenbroek, shows that this also may cause hæmatocele, but this variety is extremely rare.

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[1] See paper by Andrews on the Anatomy of the Pregnant Tube: "Jour. of Obstet. and Gyn.," May 1903.

Other Sources of Hæmorrhage.

Apart from the rupture of an extra-uterine gestation, we have the following anatomical sources for hæmorrhage. There may be rupture of veins of the pampiniform plexus or of the veins below the uterine peritoneum. The hæmorrhage, according to Virchow, may arise from vessels developed in the false membranes of pelvic peritonitis. The rupture of a Graafian follicle in the ovary may also have considerable hæmorrhage associated with it, leading to hæmatocele.[1] It has also been alleged that blood may regurgitate from the uterine cavity along the tube into the peritoneal cavity at the menstrual period, but this is doubtful.

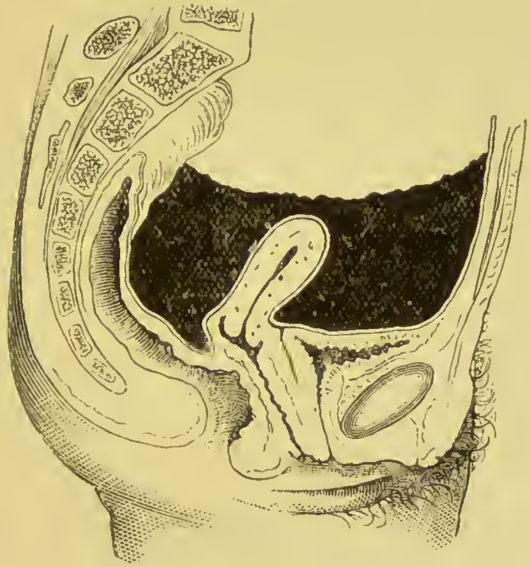

FIG. 107.

COPIOUS BLOOD-EFFUSION ANTE- AND RETRO-UTERINE.

Schroeder held that where there is a palpable tumour, the blood must be poured out below adhesions; we now know that in most cases the limiting adhesions are secondary to the blood effusion. In most cases of recovery it becomes entirely absorbed. As the result of abdominal section for ruptured Fallopian tube gestation, it has been noted that the effused blood becomes increased in specific gravity and stains sponges deeply.

In the extra-peritoneal effusions the fate of the extravasated blood is to a great extent local. The blood-clot is formed into connective tissue, and large areas of blood crystals are found.

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[1] As in a case recorded by Gabriel (Arch. f. Gynäk., Bd. LXIV., S. 418) who has also collected several similar cases from the literature.

ETIOLOGY.

Etiology.

The table quoted below shows that pelvic hæmatocele is most common in women between the ages of 25 and 35—that is, women in their period of full menstrual and sexual vigour. Out of 43 cases, the ages, according to Schroeder, were as follows :—

In	3	cases, or	7·0	p. c.,	the ages were . .	22-25
,,	**14**	,,	32·5	,,	,, . .	**25-30**
,,	**13**	,,	30·2	,,	,, . .	**30-35**
,,	9	,,	20·9	,,	,, . .	35-40
,,	3	,,	7·0	,,	,, . .	40-43
,,	1	,,	2·2	,,	,, . .	53

It is more common in parous women; there is considerable difference of opinion as to its frequency, Olshausen placing it as high as 4 p. c. of all female diseases, while Schroeder estimates it only at ·7 p. c.

Under pathological anatomy we have spoken of extra-uterine gestation as the chief cause of hæmatocele. Apart from pregnancy, it may result from violent exertion, such as dancing, during the menstrual period. Blood conditions such as purpura, scorbutus, and hæmophilia predispose to it.

SYMPTOMS.

Symptoms.

The chief symptoms are menorrhagia, sudden onset, sudden bloodlessness, pain. In tubal mole the attacks of pain recur, while in tubal abortion there is often an attack of colicky pain. In a case, when on abdominal section a tubal abortion was found, the pains simulated those of the first stage of labour. The pulse may become feeble from anæmia, and the temperature is not above normal at first, but for the next few days during the rallying period there is often a rise of a degree or two. Menorrhagia is not always present, and the bloodlessness may not be very well marked; sometimes patients have a sudden faint feeling. In cases of copious effusion from rupture of an extra-uterine pregnancy, the symptoms are often like those of irritant poisoning: viz., sudden onset, prostration, vomiting. The marked anæmia, however, points to some internal hæmorrhage; inquiry should then be made as to menstruation, and this always followed by bimanual examination. A period or two may have been passed prior to rupture of an ectopic gestation, but not always. In Fallopian-tube gestation the decidua may be discharged from the uterus before actual rupture.

In retro-uterine hæmatocele, we find frequent painful micturition and difficulty in evacuation of the bowels. There is sometimes retention of urine.

PHYSICAL SIGNS.

Physical Signs.

These differ according as the effusion is posterior or lateral to the uterus.

Posterior to the uterus.—When blood is poured out under the pelvic peritoneum, beside the pouch of Douglas, or has become encysted, we may get the following. On abdominal percussion, dulness may be present. On vaginal examination, a resistant bulging tumour is felt, varying in size from that of a billiard ball to that of a child's head, and sometimes filling up a large part of the pelvic cavity; the os uteri is pressed close behind the symphysis, looks downward, and is often almost inaccessible (figs. 105 and 106). A good plan to get at it is to turn the index finger palmar surface to the symphysis, and push it well up. *On bimanual examination, the fundus uteri is felt unusually distinct, beneath the abdominal walls and above the pubes, and generally to one or other side.* This settles the point that the tumour is retro-uterine. Considerable bleeding into the peritoneal cavity may give dulness on percussion but no bulging of the fornices. In cases undergoing resolution, irregular masses may be felt, due to blood-clot in the tube, or to effused blood which has become capsulated and is undergoing absorption.

Lateral to the uterus.—Here the effusion is usually between the layers of the broad ligament, and we get displacement of the uterus to the opposite side, arched dulness on abdominal percussion to one or other side of the hypogastric region with bulging more or less marked in the lateral or posterior fornices (fig. 104). When the effusion is peri-uterine, we get the abdominal dulness more extensive and the bulging in the fornices all round the uterus. Pelvic peritonitis is often a result of the intra-peritoneal form of blood effusion.

All that has been given here is only how to recognise intra-pelvic hæmorrhage, which is merely a symptom or sign of some lesion. The diagnosis of the lesion causing the hæmorrhage is, except in the case of extra-uterine pregnancy, very often beyond our clinical knowledge.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

Diagnosis and Differential Diagnosis.

Pelvic hæmatocele requires to be diagnosed from—

Pelvic peritonitis followed by encysted serous effusion in pouch of Douglas,
Pelvic cellulitis,
Fibroid on posterior wall of uterus,
Ovarian cyst behind uterus,
Retention of blood in horn of a malformed uterus,
Retroversion of non-gravid or gravid uterus.

Of these we consider at present only pelvic peritonitis and pelvic cellulitis. The others will be treated of, each under its respective head.

In these two purely inflammatory affections we have the inflammatory symptoms from the first; without a history of sudden onset, of menorrhagia, or of the symptoms of internal hæmorrhage. Further, the difference in etiology of hæmatocele and peritonitis will help us. The history is the most important aid in diagnosis.

A ruptured ectopic gestation with hæmorrhage and the discharge of a uterine decidua has been taken for an ordinary abortion. The general anæmia of the patient and the abdominal symptoms should prevent such a mistake.

When we have the rare form of hæmatoma due to blood effusion between anterior rectal wall and posterior vaginal wall there may be great straining present, and marked swelling felt *per rectum.*

COURSE AND RESULTS.

Course and Results.

In many cases the blood effused becomes entirely absorbed in the course of weeks or months. The time will vary according to the nature of the case. In one caused by tubal abortion the duration will be longer owing to repeated bleedings. In cases where only one bleeding has occurred the absorption will be more rapid.

The tumour, with partially clotted or purulent contents, may burst into the rectum, bladder, vagina, or peritoneal cavity; in the last case, fatal peritonitis may follow.

When the blood effusion is very large, death may be rapid.

PROGNOSIS.

Prognosis.

As to life.—This is, as a rule, settled soon. The most fatal cases are extra-uterine pregnancies, and those in which there are no peritonitic adhesions to limit the blood effusion. After peritonitis is set up, the prognosis is much as in pelvic peritonitis.

TREATMENT.

Treatment.

(1.) *Palliative.*—Here the fact already alluded to must be emphasised, that the vast majority of cases of hæmatocele and hæmatoma are due to some disturbance of an ectopic gestation, and this at once suggests operation. In certain cases, however, palliative treatment may be sufficient, although it entails careful watching and sometimes an element of risk. In palliative treatment, rest, the local application of an ice-bag, and administration of milk diet are the main features. The cases suitable are those where an ectopic gestation can be excluded, and where the general symptoms of hæmorrhage are not marked, and also

Palliative Treatment.

those cases of ectopic gestation which have ruptured into the broad ligament and the resulting hæmatoma shows no tendency to increase in size. In cases calling for operation it is often well to carry out this line of treatment for a few hours, in order to allow the patient to recover from the initial shock, and so be in better condition for surgical interference. In such cases, however, the patient should be in circumstances where operation by abdominal section can be performed, if necessary, without delay. After the patient has recovered her colour, and her pulse its old volume, pelvic examination will show whether complete absorption has taken place, or whether some evident remains in the tube and its neighbourhood may not still call for operation.

In broad ligament hæmatomata, the attacks of collapse are not so well marked as in intra-peritoneal blood effusions, and it must be kept in mind that, in such, a broad ligament gestation may be developing. The appearance of a lateral or partly mesial tumour above the brim after a history of three or four months' amenorrhœa, with the history of collapse attacks and of the discharge of a decidua, or of a supposed abortion, is highly suggestive of such an occurrence and not merely of a blood effusion.

Operative Treatment.

(2.) *Operative treatment.*—This is usually by abdominal section, but vaginal section has been employed in some instances.

In a case where a disturbed tubal gestation calls for operation the abdomen should be opened, the blood clots and blood removed, the affected tube ligatured and removed, and the abdomen closed. Troublesome oozing, not controlled by pressure or ligature, may require the iodoform tampon. This is probably best employed after an opening has been made from the posterior fornix into the pouch of Douglas. The tampon, consisting of a long strip of iodoform gauze, is first pulled through from the pelvis into the vagina in part, the patient being in the Trendelenburg posture, and then the pelvic portion packed over the oozing surfaces. The abdomen is then closed. In from three to four days the gauze is removed by pulling on the vaginal end. Prior to the operation, the genitals have been shaved and the vagina cleansed. Mikulicz's tampon may be employed, the end of the tampon being brought out at the lower end of the abdominal incision.

Some operators choose the vaginal route in apparently encysted cases, opening through the posterior fornix mesially with sharp-pointed scissors, the rectum being protected from injury by the insertion of a finger, and then expanding the blades. Blood clot can thus be evacuated and the iodoform tampon employed. This method, however, has been found uncertain, dangerous, and has sometimes necessitated hurried abdominal section in addition. Were one certain of the blood clot being extra-peritoneal or encysted peritoneally, and that there was not a developing gestation, it might be more generally employed.

If suppuration occur it must be treated as in pelvic abscess (*v.* p. 182).

NEW GROWTHS IN THE PELVIC PERITONEUM AND CONNECTIVE TISSUE (BROAD AND ROUND LIGAMENTS).

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ROUND LIGAMENT.—*Goodell*—Lessons in Gynecology: Philadelphia, 1880. *Graham*—Hydatid Disease in its Clinical Aspects: Edin., 1891. *Sänger*—Weitere Beiträge zur Lehre von den primären desmoiden Geschwülsten der Gebärmutterbänder, besonders der Ligamenta rotunda: Archiv. f. Gyn., XXI. 279 and XXIV. 1. *Schroeder*—Krankheiten der weiblichen Geschlechtsorgane: Leipzig, 1878, S. 417. *Thomas*—Diseases of Women: Philadelphia, 1880, p. 136. *Wile*—Hydrocele in the Female: Am. J. of Obst., July 1881, which see for further literature. *Winckel*—Lehrbuch der Frauenkrankheiten: Stuttgart, 1886.

TUMOURS OF THE BROAD LIGAMENT.

Tumours of Broad Ligament.

Hæmatoma and inflammatory conditions of the broad ligament have been already considered. We need only further mention that we may have cysts, fibroids (rare), phleboliths, cancer, and tuberculosis; the last two are only parts of a general peritoneal affection. Ovarian cysts may develop into the Broad Ligament, and cysts may develop in the Broad Ligament independently of the Parovarium. Cysts of the Broad Ligament will be considered along with Ovarian Tumours.

HYDROCELE OF THE ROUND LIGAMENT.

Hydrocele of Round Ligament.

Nature and Pathological Anatomy.—This is a rare malady, and may exist as encysted fluid about the round ligament (extra-peritoneal), or in the canal of Nuck—a process of peritoneum extending from the internal inguinal ring to the labium majus. It may be closed at the internal ring, thus forming a cyst; or it may communicate with the peritoneal cavity.

The fluid is serous in its nature; it may be olive green in colour.

Physical Signs.—(*a*) *Of encysted hydrocele of the cord.* An oval translucent swelling exists in the inguinal canal. It cannot be returned into the abdominal cavity, has usually existed for some time, is not tender on pressure, and gives rise to no symptoms. It must be differentiated from an ovary in the inguinal canal, and from incarcerated hernia.

(*b*) *Of hydrocele in the labium majus.* The labium majus is distended with a fluctuating tumour, dull on percussion and of translucent appearance; usually, the contents cannot be returned into the abdominal cavity. Aspiration gives a clear fluid. It is to be diagnosed from hernia in the usual way.

Treatment.—Aspiration and drainage; or aspiration and injection of a few drops of tincture of iodine. Goodell recommends that when the labial form communicates with the abdominal cavity, the internal ring should first be firmly compressed and the injected fluid then sucked out.

TUMOURS OF THE ROUND LIGAMENT.

Tumours of Round Ligament.

Fibrous, myomatous, sarcomatous tumours, and their combinations, have been described in the round ligament by Sänger. They may develop in any part of its course: intra-peritoneally; within the inguinal canal; or extra-peritoneally—in the abdominal wall, the pelvic cellular tissue or the labia majora. Such tumours are rare, those of the third group (extra-peritoneal) being the most frequent. They are easily removed except when extending down into the pelvis.

ECHINOCOCCI IN THE PELVIC ORGANS.

Echinococci in Pelvic Organs.

Echinococci or Hydatids are the sexually immature forms of the Tænia echinococcus, a small tapeworm found in the intestines of the dog. When present in the human body, they form elastic tumours and may occur in the female pelvic organs.

Freund, in 25 years, met with 19 cases—of which 7 were in the pelvic connective tissue: while Schatz met with 6 out of 7000 gynecological and obstetric cases (1 in 1166). Schatz has also collected 66 cases of Echinococcus disease in the female pelvic organs and found the frequency as follows: 14 in uterus, 14 at pelvic brim, 10 in Douglas' pouch, 7 in ovary, 7 in broad ligament, 7 in pelvic connective tissue, 5 between rectum and vagina, 2 between bladder and vagina.

They may remain many years without symptoms or may perforate into bowel or bladder. When large, they cause pressure *symptoms* on bladder and rectum. The *physical signs* are those of a tense elastic tumour without pain; at first, usually situated near the rectum; and ultimately, when increased in size, displacing the pelvic organs as an ovarian tumour would when developing between the layers of the broad ligament, *i.e.*, first forwards and then upwards. The *diagnosis* is often difficult and tapping may be requisite. When they project sufficiently into the abdomen, the treatment is laparotomy with shelling out of the tumour; or incision of the sac, with careful cleansing and stitching the edges to the abdominal incision. When pelvic, the sac is opened and drained (*v.* p. 182). Hydatids are rare in this country, but common in Iceland and Australia (Cobbold).

TUMOURS OF THE PELVIC CONNECTIVE TISSUE.

Tumours of Pelvic Connective Tissue.

We may have fibro-myomata, sarcomata, or dermoid cysts as primary conditions in the pelvic connective tissue.

Fig. 108 shows the pelvis from an interesting case of primary sarcoma which began in the connective tissue at the left side of the uterus and spread through the lymphatic glands. This case presented the following points of interest.

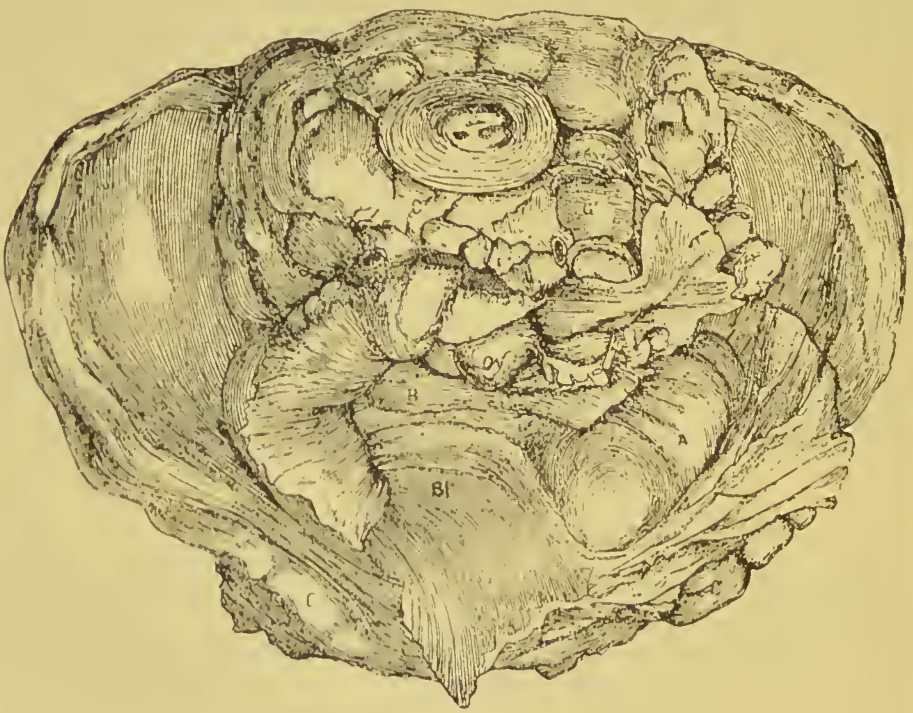

FIG. 108.

SARCOMATOUS TUMOUR OF THE PELVIC CONNECTIVE TISSUE (*Hart*).
A Tumour, B Uterus, Bl Bladder, Ov Ovary, c c Inguinal, and c′ c′ Sacral Lymphatic Glands.

A. B., æt. twenty-seven, was an undersized, wretchedly thin girl, who had felt unable for her usual occupation of a domestic servant; but the medical man whom she had consulted had been unable at first to find anything tangible to account for her condition. Afterwards, however, the inguinal glands of the left groin (those parallel to Poupart's ligament) began to be enlarged, and the left leg was painful and somewhat swollen. In the vast majority of cases, enlargement of the inguinal glands parallel to Poupart's ligament means some irritation in the external genitals or lower fourth of the vagina, an irritation either syphilitic, gonorrhœal, or cancerous. The external genitals and vagina were in this girl, however, perfectly healthy, and the condition of the parts was, further, virginal. Deep palpation of the left iliac region gave a sense of resistance at the left margin of the true pelvis; and, on bimanual examination of the pelvic organs, the normal-sized uterus was lying close to the right margin of the true pelvis; at the left side of the true pelvis could be felt a firm resisting mass, about the size of half a cocoa-nut. It seemed firmly fixed to the pelvic wall, and gave no feeling of fluctuation. Any operation was hopeless, and one could only palliate the pain by large doses of morphia given hypodermically.

The girl died miserably about six months afterwards. On *post-mortem* the pelvis was removed, and fig. 108 gives a view of the parts as seen through the brim. The displaced uterus (B), subperitoneal malignant mass (A), enlarged inguinal glands on both sides (C C), and the large mass of the sacral glands (C′ C′) are well seen. On more minute examination, the enlarged obturator glands were found, as well as the sacral ones in front of the sacrum. The primary tumour (A) did not communicate directly with the enlarged left inguinal glands. Microscopical examination showed it to be a round-celled sarcoma. This case illustrates not only a rare form of pelvic disease, but also lymphatic communication between the obturator glands and those of the inguinal glands parallel to Poupart's ligament.

Sarcoma may also arise in the recto-vaginal septum and produce a swelling simulating, from its position and the displacement caused by it, a retro-uterine tumour in the pouch of Douglas.

In the rare Dermoids of the recto-vaginal septum, the perineal body may be split transversely by an incision and the tumour enucleated.

SECTION IV.

AFFECTIONS OF THE FALLOPIAN TUBES AND OVARIES.

CHAPTER XIX. Pathology of Fallopian Tube and Parovarium.

,, XX. Diagnosis and Treatment of Tubal Disease.

,, XXI. Malformations of Ovary: Ovaritis and Periovaritis: Hernia, Prolapsus: Operations for removal of Appendages.

,, XXII. Pathology of Ovarian Tumours.

,, XXIII. Diagnosis of Ovarian Tumours.

,, XXIV. Operative Treatment of Ovarian Tumours.

CHAPTER XIX.

PATHOLOGY OF FALLOPIAN TUBE AND PAROVARIUM.

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PLATE V.

Fig. 1.

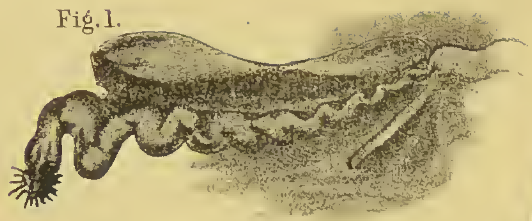


Fig. 2.

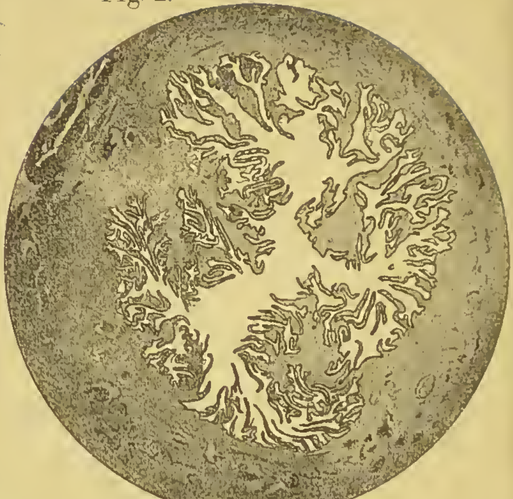


Fig. 3.

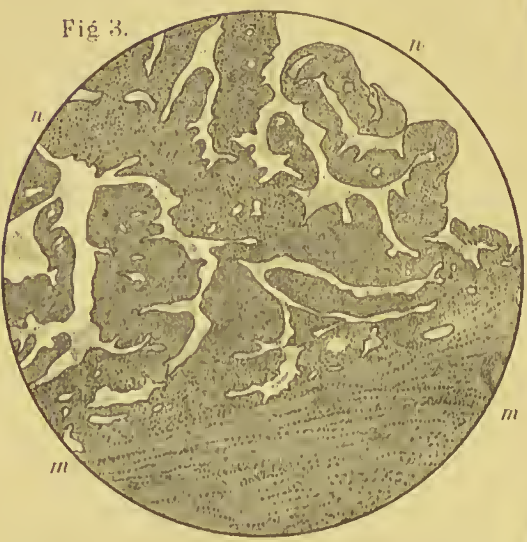


Fig. 5.

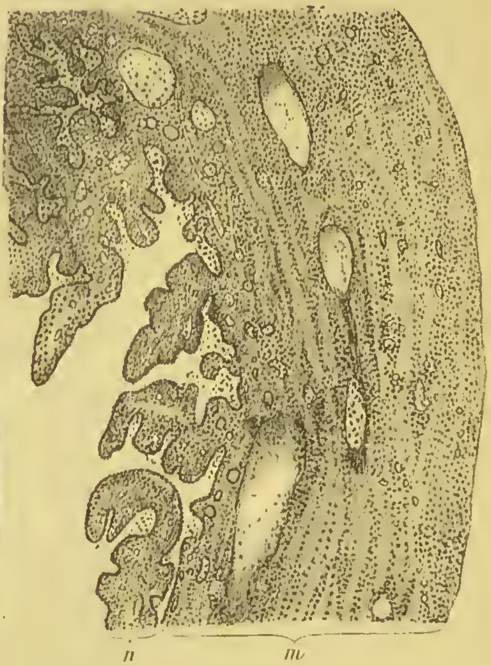
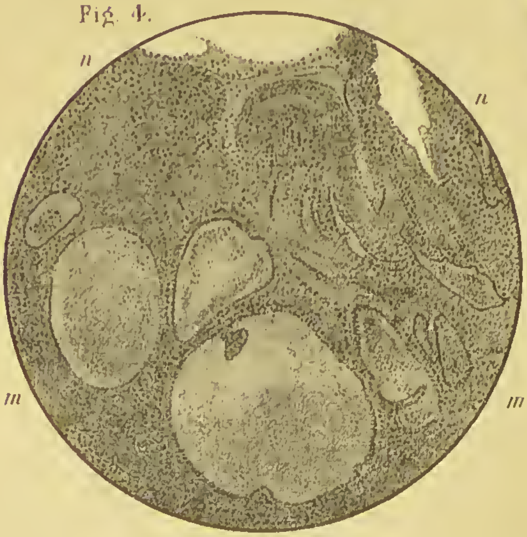


Fig. 4.



MUCOUS MEMBRANE OF FALLOPIAN TUBE,
NORMAL AND DISEASED (*Martin*).

FIG. 1. Fœtal tube, showing sinuosities.
FIG. 2. Normal mucous membrane.
FIG. 3. Mucous membrane in chronic catarrhal salpingitis.
FIG. 4. ,, ,, pseudo-follicular ,,
FIG. 5. ,, ,, purulent ,,
m. Muscular wall. *n.* Mucous membrane.

FALLOPIAN TUBE.

Preliminary Considerations.

Preliminary Considerations.—Our present knowledge of tubal disease is of comparatively recent growth. While attention had been drawn to the connection between inflammatory and uterine disease by several authors (E. Martin, Buhl, 1859, Hennig), and while Cruveilhier's famous atlas (1843) pictured conditions to which both the obstetrician and gynecologist obstinately shut their eyes, the importance of tubal conditions did not practically influence Gynecology until the abdominal sections, initiated mainly by the bold theories of Battey and Tait, revealed in the living woman conditions of the tubes which had never been dreamt of. Before this epoch the gynecologist occupied himself in trying to determine whether the inflammatory swellings he discovered clinically were peritonitic or cellulitic, but there was no active operative treatment, whichever he determined them to be.

Noeggerath did most excellent service by his speculation as to latent gonorrhœa in the male being the cause of much pelvic disease in women, and in this he has been followed by various observers, A. MacDonald, Sänger, W. J. Sinclair, and many others.

While the discovery of tubal disease has come late into gynecology it must be kept in mind that gynecology itself is not much older than half a century, and it is really only within the last few years that such conditions could be fairly and fully understood. It must not, indeed, be forgotten that without the knowledge we now possess of septic infection, of the micro-organismal nature of gonorrhœa and of tubercle, Noeggerath's theory would have remained a speculation, and probably a much derided one. Thanks, however, to many factors, to the clinical work of the operating gynecologist, to improved microscopical technique, and, above all, to Bacteriology, we are now in a position to investigate and treat a series of diseases too long unknown. The general causation of acute and chronic inflammatory tubal disease has now been shown to be due, in the main, to micro-organisms, of which the chief are gonococci (for gonorrhœa); streptococci (for septic cases): the contents of the tube may be sterile. In 206 cases Wertheim found the gonococcus in 56 cases; streptococci in 11; staphylococci in 6; pneumococcus lanceolatus in 1; and in 122 instances, the results of bacteriological examination, were negative.

Anatomy and Physiology of Tubes.

Anatomy and Physiology of the Tube.—This has been already fully considered, and we here discuss only a few points.

The tubal lining is a much folded one (*v.* Plate V., fig. 2), and these folds are exactly analogous to those in the uterine mucous membrane proper. The question therefore arises as to whether we may consider them as glands. The opinion that they are so, is held by Bland Sutton, who also alleges that they furnish an albuminous covering to the ovum during its descent. At present, however, it is best to consider it as a much folded mucous membrane, and to defer the question as to its real nature until sufficient facts have been collected.

The tube probably does not take any part in menstruation, *i.e.*, it furnishes neither blood nor epithelium during that period (*v.* p. 86). The real and effective source of the menstrual discharge is the triangular uterine area, bounded above by the internal openings of the tubes, and below by the *os internum.* The student, may, however, ask how the occasional existence of tubes distended with blood can be explained, if it is not due to retained menstrual fluid. The answer to this is furnished, however, by the occurrence of other pathological conditions of the tubes, as in early tubal gestation and atresia vaginæ.

Function of Tubes.

The main *functions* of the tubes are :—

(1) To act as a duct between ovary and uterus; and (2) to act as a canal for the passage of the spermatozoa after these have been placed in the genital tract by coitus, and also as a receptaculum seminis, the spermatozoa probably being able to live in the tube, perhaps as long as three weeks.

(1) As we have already seen, an ovum is periodically shed at or near a menstrual period, and is carried along the tube to the uterus. How this is accomplished is much disputed. The cilia of the tube and uterus work towards the os externum, and it is evident that we have thus a mechanism for the transport of the ovum which cannot be gainsaid. The experimental observations of Pinner, who injected salt solution with corpuscular elements into the peritoneal cavity of rabbits and found this fluid in the lower genital tract, are of importance, although it may be urged that this might be a mere oozing into the tract due to increased intra-abdominal pressure. The ova of Ascaris Lumbricoides were injected by Lode, and although these are only half the size of the rabbit's ova they were detected in the tube some hours afterwards. Ciliary action, therefore, seems the main factor in carrying on the ovum, and we must assign a very minor part, if any at all, to the tubal peristalsis itself, or to the alleged actual grasping of the ovary by the fimbriated end of the tube at the time of the escape of the ovum.

(2) The passage of the spermatozoa along the tube is undoubtedly effected in the main by their independent movements, and it is stated that they can progress 1 to 6 mm. in one minute.

The question has been much disputed as to where the single spermatozoon necessary for fertilisation meets the ovum, whether in the tube or in the uterine cavity. It is impossible to determine the question accurately in the human female. A much more important point is the site of grafting of the impregnated ovum. As a matter of fact this normally occurs within a certain definite area, which may be termed the "area of safe implantation." The three points determining this area are the inner openings of the Fallopian tubes and the os internum. This also determines the area from which the epithelium is shed at a menstrual period, and establishes a causal relation between menstruation and the area of safe grafting of the ovum, not yet quite thoroughly understood.

When the ovum grafts in the tube, *i.e.*, outside the internal opening, we get the abnormal early gestation known as tubal gestation.

The *route* of infective action is of great importance. This may be by the epithelial lining of the tube, but more often it is by the lymphatics of the tubal and uterine tissue. From the abundance of the lymphatic supply and its free anastomosis it can be readily understood that we do not get a purely tubal infective condition, but a combination in which mainly tube and ovary take part—the so-called Salpingo-oophoritis, *i.e.*, an inflammatory condition affecting and matting together tube and ovary.

It is through the tubes that the pelvic peritoneum is also in many cases infected, *i.e.*, *pelvic peritonitis is usually secondary to tubal disease.*

CLASSIFICATION OF TUBAL DISEASES.

Classification of Tubal Diseases.

The classification of tubal diseases is admittedly difficult, but the most scientific yet brought forward is that of Martin in his valuable work; this we follow with only some slight modification. The diseases are grouped as follows:—

(1) Abnormalities.
(2) Sinuosity, stricture, occlusion, and torsion.
(3) Patent tube.
(4) Catarrhal conditions, without distension, comprising—
    (*a*) Acute endosalpingitis;
    (*b*) Chronic diffuse interstitial salpingitis, including salpingitis isthmica nodosa, and salpingitis chronica productiva vegetans.
(5) Catarrhal conditions associated with occlusion and leading to distension; hydrosalpinx (sactosalpinx serosa).
(6) Purulent salpingitis; pyosalpinx (sactosalpinx purulenta).
(7) Infectious granulomata—syphilitic, tuberculous, actinomycotic.
(8) Hæmatosalpinx (sactosalpinx hæmorrhagica).
(9) New formations and tubo-ovarian cysts.

We shall in the present chapter first consider methods of examination, then the pathological conditions, and take up the *Diagnosis*, *Prognosis*, and *Treatment* in Chapter XX.

Bimanual Examination of Tubes.

Bimanual Examination of Tubes.

Can the normal Fallopian tubes be palpated in the Bimanual? The student will probably have already noted that, in considering the Bimanual (Chap. VIII.), we did not name the Fallopian tubes as structures whose form and limits he was expected to define. In a very favourable case, the conjoined manipulation may recognise them at their uterine origin, more especially if the rectal examination be made and the uterus be well drawn down with the volsella. Practically, the Fallopian tubes (unless dilated) are not palpable on ordinary examination.

When the tube is not much distended its inner relation to the uterus can be well mapped out both on vaginal and rectal examination.

Catheterisation of the tubes.—In certain undoubted cases the uterine sound has been passed along the Fallopian tube, while in others the supposed sounding of the tube has been really the perforation of the uterine wall. It is impracticable to sound the normal Fallopian tubes to any effect; and the procedure is by no means devoid of danger.

(1) ABNORMALITIES—HERNIA.

Abnormalities.

These are of little practical interest. The chief are, an accessory fimbriated end; defective development; displacement; want of apposition of fimbriæ and accessory tubes to ovary (Lawson Tait). The hydatid of Morgagni (fig. 109, *S*) is attached to the tube, and arises from the duct of Müller. It is lined by ciliated epithelium, has sometimes unstriped muscle in its walls, and in its stalk always.

Hernia of the tube is a rare condition, only twenty-four cases having been collected by Morf[1]; of these thirteen were inguinal, ten femoral, and one obturator.

(2) SINUOSITY, STRICTURE, OCCLUSION, AND TORSION OF THE TUBES.

Sinuosity, Stricture, Occlusion, and Torsion of Tubes.

The tube may be unduly sinuous, a persistence of a fœtal condition (Freund). (Plate V., fig. 1).

The tube may have a congenital stricture; or may become closed at the uterine or the fimbriated end, or in the middle. When stricture occurs at the uterine end, it is said to be caused by implantation of the placenta there, or by endometritis with adhesion. In the middle, small tumours or adhesions may cause strictures—in the latter case usually partial. At the fimbriated end, the occlusion is due to a catarrh of the tubes which has spread to the peritoneum and set up adhesive peritonitis.

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[1] "Annals of Surgery," March 1901.

These strictures are of importance in relation to sterility and fluid accumulations (pus, serum, blood) which they favour; but in themselves cannot be diagnosed during life.

Torsion of the tube only occurs when the tube is dilated, as in hydro- and pyo-salpinx. It occurs at the uterine end of the tube and may cause symptoms similar to torsion of the pedicle of an ovarian tumour.[1] It has also been noted in tubal gestation.[2]

(3) PATENT CONDITION OF THE TUBES.

Patent Condition of the Tubes.

By this is meant undue dilatability. It is of great importance in relation to uterine injections. Even in careful injection of the uterine cavity, post partum or otherwise, fatal results have followed from the fluid passing along the tube into the peritoneal cavity. "Forcible uterine injections on the cadaver, with the cervix entirely filled up by the syringe, almost always sent fluid along the tubes into the peritoneal cavity. Less forcible injections under like conditions sent the fluid along a less distance (2–3 mm.), and often sent it into the veins; while gentle injections with a tube not filling the cervical canal sent fluid neither into the tubes nor veins." Bandl, from whom the above is taken, records a case where death resulted from injection of an aborting uterus with perchloride of iron, although the injection pipe was less in diameter than the cervix. Death may be immediate from shock, or some days after from peritonitis.

Winckel has recorded a unique case where a round worm (Ascaris Lumbricoides) was found calcified on the posterior surface of the uterus and left broad ligament. It had probably passed from the anus into the vagina and ultimately through the Fallopian tube into the peritoneal cavity.

(4) CATARRHAL CONDITIONS WITHOUT DISTENSION.

Catarrhal Conditions without Distension.

This is the most common inflammatory condition of the tubes, and forms about 30 per cent. of tubal cases.

Simple catarrh of the lining of the tube (acute endosalpingitis) is rarely primary, and is, as a rule, secondary to uterine or peritoneal conditions.

The most common cause is certainly micro-organismal—gonorrhœal and septic; while as minor causes we may put down irritating injections of iodine, unskilful manipulation of the organs during examination, and the careless use of the unpurified uterine sound or of intra-uterine pessaries.

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[1] Hartmann: "Annales de Gyn. et d'Obstet.," Feb. 1900. Waldeau: "Am. Journ. of Obst.," 1901, p. 178. Cases have been recorded by Weir: ibid. p. 529; Lewers: "Lond. Obstet. Trans.," 1902, p. 362; Handley: "Lond. Obstet. Trans.," 1903, p. 157.

[2] Pozzi: "La Gynécologie," June 1900.

The infectious fevers (scarlet fever, measles, cholera, etc.), have also some place in producing tubal inflammatory conditions.

The tubes are congested, more tortuous, and their secretion contains white and red blood corpuscles and mucus.

The foldings of the mucous membrane are swollen and reddened (Pl. V., fig. 3), the chief changes being in the connective tissue; the alterations in the epithelium are less marked, but it may become flattened in character as the change tends to become chronic.

In the *chronic catarrhal conditions* we get small-celled infiltration of the foldings, thickening of the ends of these, loss of their epithelium and a blending of the folds (Pl. V., fig. 3). In this way the recesses of the mucous membrane get snared off, retain their secretion, and a form known as salpingitis pseudo-follicularis may thus arise (Pl. V., fig. 4). When the muscular walls of the tube become involved we have an interstitial salpingitis produced, where the connective tissue and muscular fibre are hypertrophied; this has been described as salpingitis chronica productiva vegetans by Sawinoff. The tubes are thickened, and radiating pain is a marked symptom.

A rare form of tubal disease (1 per cent. of bodies examined according to Chiari of Prag) has been termed salpingitis isthmica nodosa. It affects the uterine end of the tube, and manifests itself as small projections, like tiny myomata, consisting, however, of cysts lined with cylindrical epithelium, and having hypertrophied muscular walls. They are the result of catarrh of the lining.

(5) CATARRHAL CONDITIONS ASSOCIATED WITH OCCLUSION AND LEADING TO HYDROSALPINX.

Catarrhal Conditions with Occlusion.

Hydrosalpinx.—By this we understand a tube dilated with serum, the walls being thinned and translucent. The size of the tube may be considerable, sometimes larger than a child's head. It is the outer end which is distended, and there are usually omental and intestinal adhesions. The muscular walls are thin, the epithelium cuboidal, and there may be calcification of the walls. This is termed *hydrosalpinx simplex*; when the uterine end is patent and allows escape of fluid we have *hydrops tubæ profluens*; there occurs further a follicular form, cavities being present in cross section; a hæmorrhagic form, and also, though rarely, an emphysematous variety.

Instead of the term hydrosalpinx, that of sactosalpinx serosa has been proposed by Martin of Berlin (σακτος = tensely filled).

Etiology.

The etiology of hydrosalpinx is probably a catarrhal micro-organismal endosalpingitis to begin with, occlusion of tube, followed by marked secretion of fluid and secondary thinning of walls. In some cases, however, there is no evidence of endosalpingitis, as in a case recorded by Alban Doran,[1] where the lining epithelium was quite healthy. These cases must be explained by the occlusion of the fimbriated end of the tube by a localised peritonitis, originating in disease of some other part of the pelvis, *e.g.*, purulent inflammation of the tube on the opposite side (Cullingworth).

(6) PURULENT SALPINGITIS—PYOSALPINX.

Purulent Salpingitis.

Purulent salpingitis: Pyosalpinx. Sactosalpinx purulenta (Martin). The catarrhal form may become purulent and chronic, and when occlusion of the tube at the fimbriated and uterine ends takes place, we get the secreted pus retained and a retort-shaped tumour formed, the important and well-known pyosalpinx.

Naked-eye appearances.—The tube is distended mainly at the outer end, and its shape is thus aptly compared to a retort. The size of the tube may vary from that of the thumb to a thickness equal to the fore-arm. On longitudinal section of a pyosalpinx, intercommunicating loculi can be noted and the walls found to be thickened, although they are sometimes thinned. Adhesions may form to adjacent viscera, and the tubes may blend together at their ends (fig. 110).[2]

Causation.—On clinical data the causation of purulent salpingitis will be found to be mainly gonorrhœal, and septic after labour; and the same holds good probably for pyosalpinx, although the bacteriological evidence may be less precise.

Wertheim has collected 376 cases which have been bacteriologically examined by various observers with the following results:—

Gonococci	in 76	or 20·2	per cent.
Gonococci together with other organisms	,, 10	,, 2·6	,,
Streptococci or Staphylococci	,, 50	,, 13·2	,,
Pneumococci	,, 7	,, 1·8	,,
Bacillus Coli	,, 3	,, 0·7	,,
Undetermined Bacteria	,, 15	,, 3·9	,,
Sterile	215	,, 57·1	,,

The results of more recent bacteriological work have thus been summed up by Foulerton.[3] Of 459 cases recorded since 1890, gonococci were present in 19 per cent., other organisms in 21 per cent., while 60 per cent. showed no organisms.

Gonorrhœal infection usually spreads along the surface of the genital tract, affecting in turn the mucosa of the cervix, uterine cavity and tube, and thus reaching the peritoneal cavity and surface of the ovary. Septic infection (streptococcal), on the other hand, invades the walls, and so reaches the peri-uterine tissue, causing lymphangitis, phlebitis, cellulitis with suppuration.[1]

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[1] Doran—Double Hydrosalpinx without Salpingitis: "Lond. Obst. Trans.," 1899.
[2] As in a case recorded by Malcolm: "Lond. Obstet. Trans.," 1900.
[3] "British Gynecological Journal," 1899, p. 182.

Microscopical Anatomy.—In acute septic salpingitis, usually of puerperal origin, we have the mucous lining of the tube thickened, mainly from dilatation of the lymph spaces, which are distended with leucocytes and occasional red blood corpuscles. The secretion in the tube contains streptococci and staphylococci. As the disease spreads the muscular coat becomes infiltrated with small cells. In the gonorrhœal form the gonococci may be found in the tissue of the tube (Wertheim), and not only on the columnar epithelium as Bumm asserted. In the chronic form the spaces formed by the folds of the mucous membrane become gradually obliterated by round cell infiltration, the lumen becomes lined with granulation tissue and the wall may thicken.

In pyosalpinx the purulent secretion alters, containing altered leucocytes and red blood corpuscles, and so far as micro-organisms are concerned the result of examination may be negative.

(7) THE INFECTIOUS GRANULOMATA.

Infectious Granulomata.

By these we understand syphilitic, actinomycotic, and tuberculous conditions. The first two are of little practical importance; the third requires more detailed description.

Syphilitic conditions of the tubes are not diagnosable clinically, but gummata have been found in the adult and in the syphilitic fœtus (Ballantyne and Williams).

Actinomycosis is still more rare, but Grainger Stewart, Muir, and Hart have recorded its presence in the pelvic organs (ovary and tube). It may also form pelvic abscess and is due to a vegetable parasite (actinomyces or ray fungus). In the pus little yellowish specks may be seen, and on microscopic examination, characteristic branching filaments, as well as club-shaped filaments, and structures simulating cocci and bacilli, but really broken filaments, may be demonstrated.

Tuberculosis.—The student will note here the greater accuracy which Koch's great discovery of the *bacillus tuberculosis* has given to our knowledge on this head.

Pathological anatomy of tuberculous tubal disease.—Tuberculous disease of the tube is the most common form of tuberculous disease of the genital tract.

It may be primary, or secondary to peritoneal tuberculosis.

Tuberculous Salpingitis.

The sources of infection are not quite clear, but many observers consider that it may take place through the blood by metastasis, by the spread of tuberculous infection from the bowel, where it has been started by the ingestion of tuberculous milk or meat, and by coitus.

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[1] Reymond and Magill: "Annals of Surgery," Sep. and Oct. 1896.

PLATE VI.

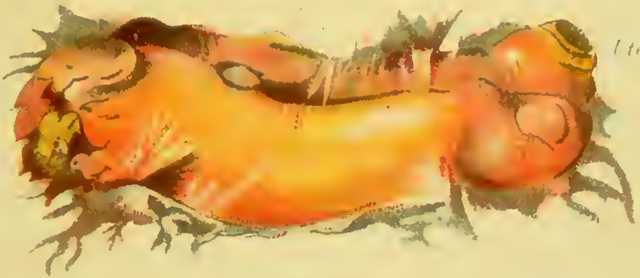

Fig. 1

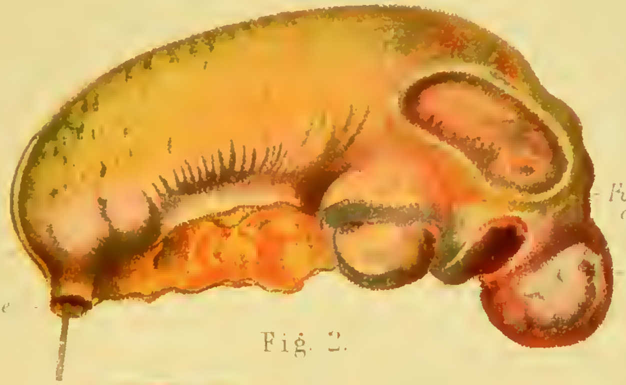

Fig. 2.

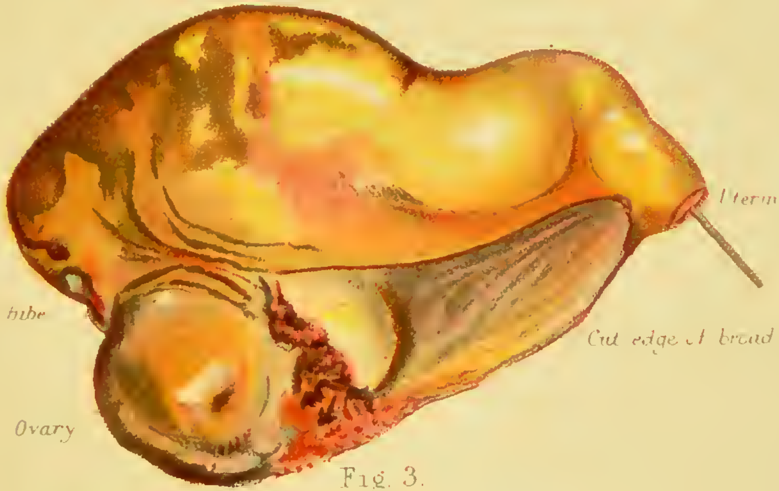

Fig. 3.

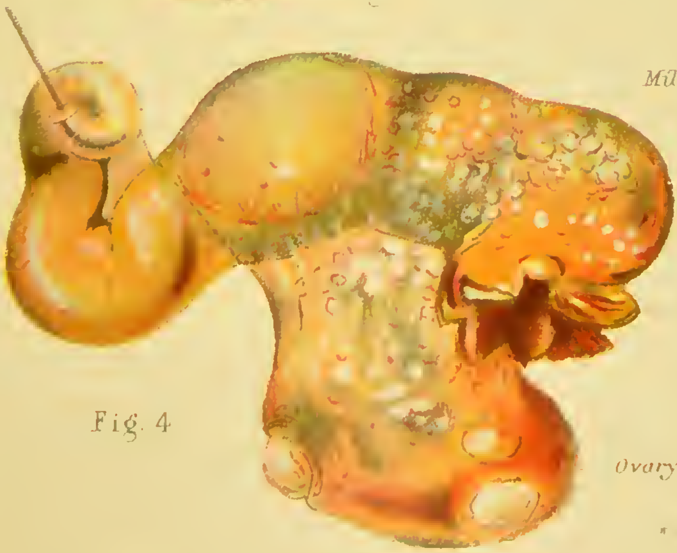

Fig. 4

PURULENT AND TUBERCULOUS SALPINGITIS (CULLINGWORTH)

FIGS. 1-3. Purulent Salpingitis.
FIG. 4. Tuberculous disease of tube.

The last source has been strongly supported by many, and a good deal can be said in its favour. The theory of this form of infection is, that as the result of genito-urinary phthisis, early or advanced, in the male, the female genital tract is infected during coitus. From the anatomically dense nature of the vaginal and cervical tissue we should not expect the bacilli to effect a lodgement there; menstrual processes would tend to hinder endometric affection. The tube appears to form the most favourable nidus for the growth of the bacillus, and this may explain the greater frequency of tubal tuberculosis.

The tubes themselves may vary considerably in appearance, from a mere irregularly thickened and beaded condition to considerable distension with pus and caseating masses. They are elongated, not retort-shaped as in pyo-salpinx (Plate VI., fig. 4). The peritoneum is often involved, and distinct masses thus formed. *Microscopically* we may find in the acute forms caseating contents in the tubes, with bacilli. The mucous membrane has round celled infiltration with giant cells and bacilli. Giant cells may not be present in the wall of the dilated portion, but will be found in the uterine end of the tube, which should always be examined.[1] In the chronic forms there is greater tendency to suppuration. Whitridge Williams recognises three forms in the tubes: (1) Miliary tuberculosis; (2) Chronic diffuse tuberculosis; (3) Chronic fibroid tuberculosis.

(8) HÆMATOSALPINX (SACTOSALPINX HÆMORRHAGICA).

Hæmatosalpinx.

It may be mentioned under this head that hyperæmia and congestion of the tube may occur in cases of measles, scarlet fever, small-pox, and cholera.

By *hæmatosalpinx* we understand distension of the tube with blood. According to some the tubes furnish blood at a menstrual period (p. 86), and if this very doubtful opinion be correct, we can understand that with any obstruction to its exit we may get the tube distended with blood.

More certain causes are developmental malformations leading to occlusion in uterus or vagina and damming back of blood.

Probably the most frequent cause is early disintegration of a Fallopian tube gestation leading to the condition known as tubal mole, where the fimbriated end of the tube is closed and thus the effused blood retained.

The size of the tube varies, the blood is often chocolate coloured, and the walls of the tube usually thickened.

Diagnosis is difficult except in cases of malformation, or where the condition of early Fallopian tube gestation is evident.

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[1] Targett: "Lond. Obst. Trans.," 1899, pp. 163, 341.

The treatment is abdominal section and removal of the tube after ligature (*v.* Chap. XX.).

(9) NEW FORMATIONS AND TUBO-OVARIAN CYSTS: OVARIAN HYDROCELE.

New Formations.

Much information has been gained as to these within the past few years, but they are of more interest to the specialist than to the student and practitioner. We therefore briefly tabulate the conditions, referring those working up such specimens, to Sänger and Barth's work in A. Martin's Handbook. The conditions recognised are:—

A. *Mucous membrane of tube.*
  1. Mucous and decidual polypi.
  2. Papillomata.
  3. Carcinomata.
  4. Deciduoma malignum.
  5. Sarcomata.
B. *Muscular wall of tube.*
  1. Myomata.
  2. Fibromata.
  3. Sarcomata.
C. *Tumours of the sub-peritoneal tissue of the tube.* Lipomata.
D. *Tumours of the peritoneum covering the tube.*
  Papillomata and cystic structures.
E. *Tumours of the fimbriated ends.*

Of all these the most interesting are the papillomatous conditions first described by Alban Doran, and the so-called deciduoma malignum. The latter will be discussed under Carcinoma Uteri.

Primary cancer of the Fallopian tube was first described by Orthmann and Doran.[1] Fifty-two cases have been recorded.[2] Most of the cases have a papillomatous growth in the inside of the tube, often projecting from the fimbriated end. The results of operation have not been satisfactory, owing to early recurrence.

Tubo-ovarian cysts result from adhesions between the fimbriated end of the Fallopian tube and the ovary, with degeneration of the corpora lutea of the Graafian follicles thus enclosed. The contents may be poured into the uterus along the tube.

Ovarian hydrocele.—Under this term Bland Sutton has described an interesting case often considered as a tubo-ovarian cyst or hydrosalpinx.

Where such are carefully examined, the tube, tortuous and dilated, is found to open into the cyst. It is probably a complete pouch of peritoneum surrounding the ovary as in the seal and rat (Robinson), instead of the shallow ovarian fossa in which the human ovary normally lies (*v.* p. 26). The ovary may be seen in the floor of the cyst in small specimens, but in large ones becomes thinned out on the cyst wall.

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[1] "Trans. Path. Soc.," Vol. XL., p. 221. In 1898 he had collected twenty-five cases, "Lond. Obstet. Trans.," p. 197.

[2] Graefe: "Cent. f. Gyn." 1902, No. 51.

Plates V. and VI. show the various pathological conditions described.

Plate V.—I. Uterus, tube, and ovary of new-born infant, to show sinuosity of tube (Martin). II. Transverse section of mucous membrane of ampulla of normal tube. III. Chronic catarrhal salpingitis: *m*, muscular coat; *n*, mucous membrane (Martin). IV. Salpingitis pseudo-follicularis: *m*, muscular coat: *n*, mucous membrane; *l*, lumen of tube (Martin).

Plate VI. shows tuberculous and purulent tubes (Cullingworth).

PAROVARIUM OR EPOOPHORON.

The diagram shown at fig. 109, taken from Doran's interesting and valuable work shows that the Parovarium, which is the remains of the Wolffian body, consists of a horizontal tube and eight or ten well-developed vertical tubes, with five or six in addition represented only

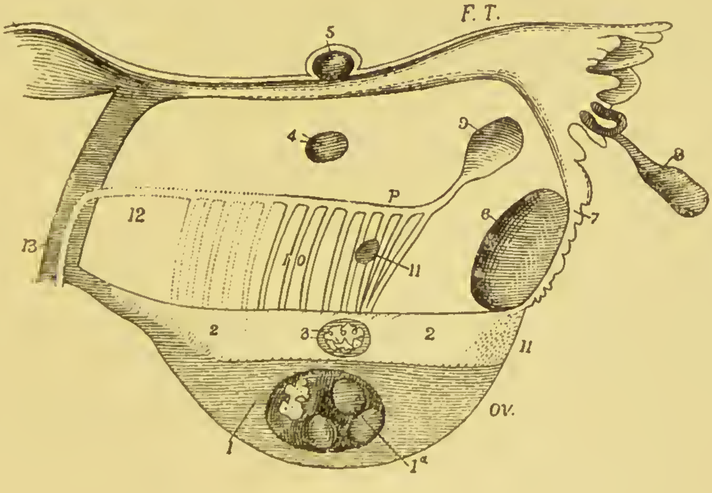

FIG. 109.

DIAGRAM OF THE STRUCTURES IN AND ADJACENT TO THE BROAD LIGAMENT (*Doran*).

1. Framework of the parenchyma of the ovary, seat of a simple or glandular multilocular cyst. 2. Tissue of hilum, with 3, papillomatous cyst. 4. Broad ligament cyst, independent of parovarium and Fallopian tube. 5. A similar cyst in broad ligament above the tube, but not connected with it. 6. A similar cyst developed close to 7—ovarian fimbria of tube. 8. The hydatid of Morgagni. 9. Cyst developed from horizontal tube of parovarium. Cysts 4, 5, 6, 8, and 9 are always lined internally with a simple layer of endothelium. 10. The parovarium; the dotted lines represent the inner portion, always more or less obsolete in the adult. 11. A small cyst developed from a vertical tube; cysts that have this origin, or that spring from the obsolete portion, have a lining of cubical or ciliated epithelium, and tend to develop papillomatous growths, as do cysts in 2—tissue of the hilum. 12. The canal of Gartner, often persistent in the adult as a fibrous cord. 13. Track of that duct in the uterine wall; unobliterated portions are, according to Coblenz, the origin of papillomatous cysts in the uterus.

by fibrous threads. The horizontal tube may be traced (12, fig. 109) to the side of the uterus forming the canal of Gartner already alluded to (p. 25). It is important to observe that the vertical tubes become lost in the hilum of the ovary; the significance of this will be referred to under Ovarian Tumours. The tubes are lined with cubical or broken-down epithelium, and may give rise to tumours known as parovarian (9, 11, fig. 109).

This form of tumour is usually produced by *the distension* of one or more, usually one, of the tubules; its mode of production may, however, be like that of papillomatous ovarian tumours in which true tumour-growth takes place. The diagnosis and treatment of parovarian tumours will be best considered along with those of ovarian (*v.* Chaps. XXIII. and XXIV.).

CHAPTER XX.

DIAGNOSIS AND TREATMENT OF TUBAL DISEASE.

For Literature see Chapter XIX. and p. 232.

Under this head we take up the symptoms and treatment of:—

(*a*) Catarrhal conditions, septic and gonorrhœal.
(*b*) Pyosalpinx and hydrosalpinx.
(*c*) Tuberculous disease.

We limit ourselves to these, as they are the conditions open to clinical recognition. Most of the others afford scope only for post-operative diagnosis.

(*a*) CATARRHAL CONDITIONS, SEPTIC AND GONORRHŒAL.

Symptoms.—The practitioner will first recognise that the case is a septic or gonorrhœal one, and the point to be considered now is, can the onset of tubal mischief, *e.g.*, its spread from the uterus, be ascertained. Acute spread to the tubes will be signalised by lateral pain and increase of temperature, but it is difficult clinically to separate this from ovarian or cellular tissue inflammatory affection.

In cases favourable to the bimanual, one is able to feel the tubal thickening.

(*b*) PYOSALPINX: HYDROSALPINX.

It is in pyosalpinx that our diagnosis is most accurate, although the condition may sometimes be missed, especially when the tubes are large and blended.

The history will be that of a previous gonorrhœal attack, or a septic attack following labour. In virginal cases the cause is tuberculous usually.

Pain of a dull constant character is often complained of, and great dysmenorrhœa is usually experienced. What strikes one most in such cases is the constant and genuine suffering of the patient.

On bimanual examination the uterus should first be mapped out and the tubes at their uterine origin carefully explored, as they are often undilated there and can be felt passing into the distended portions of the tubes.

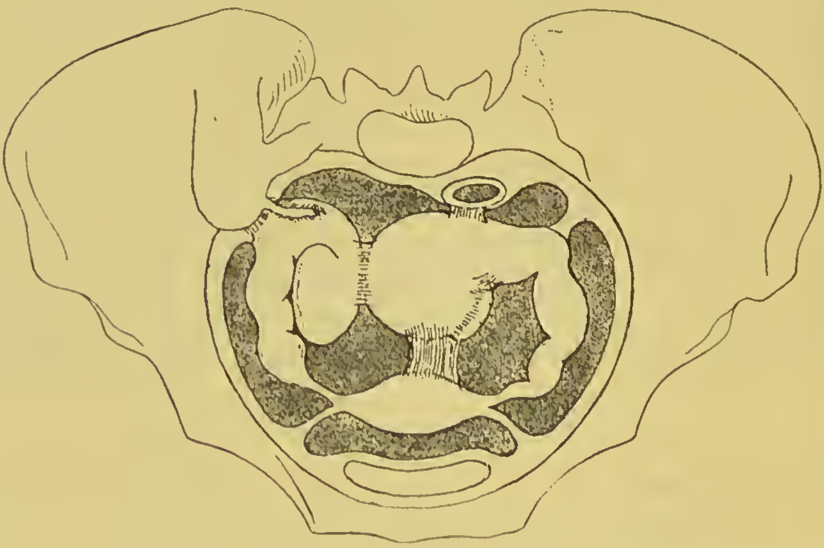

FIG. 110.

DOUBLE PYOSALPINX blended and with adhesions to rectum, uterus, and verniform appendix (*Martin*).

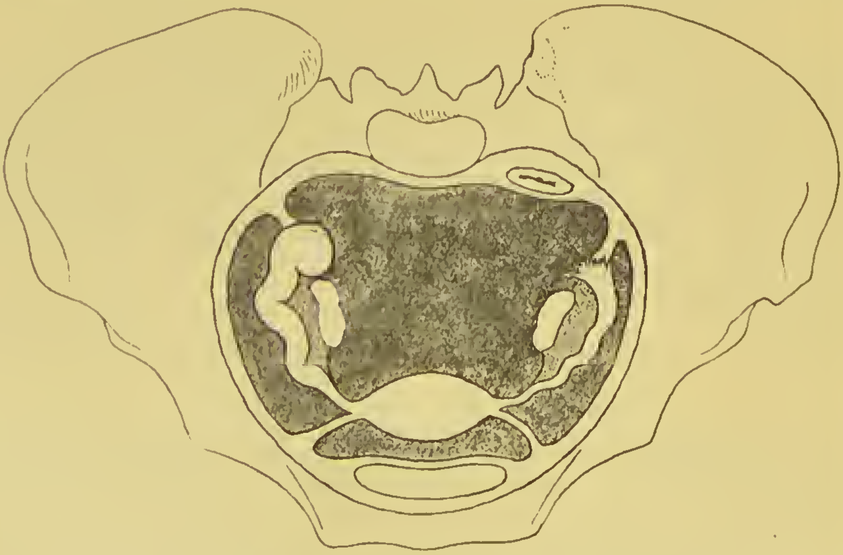

FIG. 111.

RIGHT-SIDED PYOSALPINX: left-sided catarrhal condition (*Martin*).

There is usually no rise of temperature in chronic cases. In acute cases there is usually a marked leucocytosis, but there may be none in chronic and tuberculous cases.

The distension may be considerable, and when the pelvis is filled by the distended and coalesced tubes, exact diagnosis is only possible on abdominal section.

Figs 110, 112 indicate the nature of the adhesions that may be present.

In *hydrosalpinx* the diagnosis is much more difficult, as the symptomatology is discordant in recorded cases. Thus the effect on menstruation varies, as some have menorrhagia, some have pain, and in others the menstruation is scanty.

Bimanually one can feel the cystic swelling, and when the uterus is pressed against it a sense of recoil may be felt (Landau).

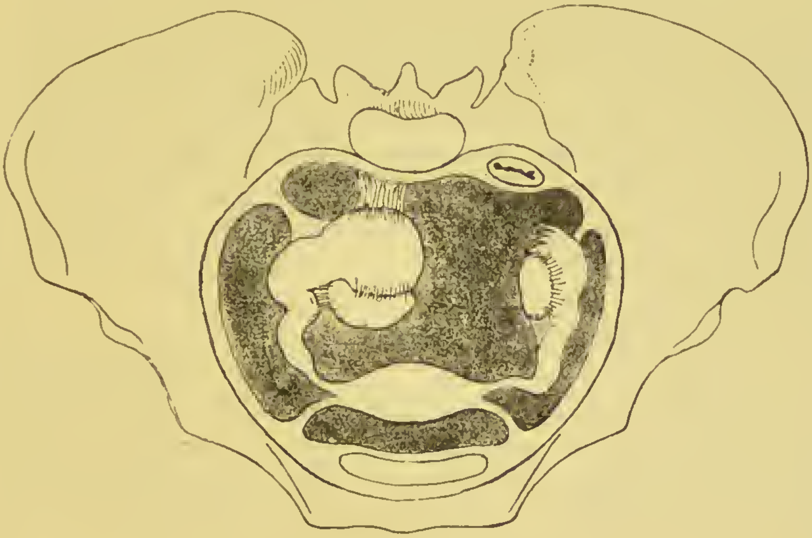

Fig. 112.

Right and Left Pyosalpinx, left ovary adherent. The right tube is adherent behind and to ovary (*Martin*).

(*c*) TUBERCULOUS DISEASES.

In early tuberculous tubal disease there is usually greater frequency of menstruation and increase in its amount. On examination, a thickened and nodular condition of the tubes may be present.

In more advanced cases where the tubes are distended with caseating matter, the negative conditions as to sepsis and gonorrhœa and the positive tuberculous tendency are helpful. The presence of tuberculous mischief elsewhere, in the lungs or urinary tract, will aid in the diagnosis.

The cases are often chronic, and one is apt to forget that the symptomatology of increased menstruation and some pain may be due to early tuberculous tubal disease.

TREATMENT OF TUBAL DISEASE.

Prophylaxis.—The facts already given as to the causes of sepsis, and the relation of septic disease in the endometrium to tubal disease, have given a material basis for antisepsis and asepsis, and dealt a death-blow to all intrauterine manipulations which cannot be carried out with strictest antiseptic precautions. The use of stem pessaries, apart from its irrational nature, is to be absolutely forbidden for this reason alone, and while vaginal pessaries are in a few cases helpful, the fact as to the occasional danger of their foulness must not be overlooked.

MINOR TREATMENT.

Minor Treatment.

In early tubal mischief such as may follow septic conditions of the endometrium (cases due to child-birth, abortion, failure of antiseptic precautions) one relies on intrauterine disinfection and thorough rest to the patient, with rest to the local organs involved. For this purpose light diet is to be given; the bowels are to be regulated by gentle laxatives and enemata, and when necessary small doses of morphia by suppository ($\frac{1}{8}-\frac{1}{4}$ gr.). All undue examination is to be avoided. Should freedom from pain and subsidence of the pulse and temperature follow, we may hope that the mischief has passed off.

When chronic thickenings persist they are to be treated with the ichthyol tampon (*v.* under Ovaritis) and blisters. Iodide of potassium and mercury will be found useful in gonorrhœal as well as in syphilitic cases.[1] If the return to a healthy condition is slow, and pain is complained of, then a course of baths and vaginal douching at Woodhall, Kreuznach, Schwalbach, or Schlangenbad is often of the greatest service.

All this applies to cases where the condition is a non-suppurative one.

In inflammatory thickenings of the appendages, not yielding to the above treatment, and especially where there is pyosalpinx, hydrosalpinx, or tuberculous disease, the question of abdominal section has to be considered. It has been amply shown that pyosalpinx when neglected may burst and cause death. Thus J. K. Fowler found in the *post-mortem* record for three years of the Middlesex Hospital fifteen cases of pyosalpinx; in eight of these it had been the cause of death.

SURGICAL TREATMENT.

The operative treatment of tubal disease has greatly advanced of late years. The method of operation varies according as the tubes are more easily reached by vaginal or abdominal section.

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[1] Taylor: "Brit. Gyn. Journ.," 1899, p. 100.

Operations per Vaginam.

(a) *Operative Treatment by the Vaginal Route.*—When pus tubes can be felt to bulge in the vaginal roof it will be difficult to diagnose them from a suppurating cellulitis or peritonitis, and the treatment is similar. Puncture with a trocar is not now recommended. It is better that a transverse incision with knife or scissors be made close behind the posterior lip of the cervix, bleeding controlled with ligature or forceps, and a pair of forceps or pointed scissors curved on the flat, pushed into the mass and expanded so as to enlarge the opening. A finger in the rectum will enable one to avoid injuring the bowel. The pus can thus be evacuated, the cavity washed out, and gauze packed in. The result of this treatment is not as a rule very satisfactory, as the distended tube has usually multiple loculi, and it is difficult to evacuate all these in this way. If satisfactory, the question may arise if the condition has not been really one of suppurating cellulitis or peritonitis. *Vaginal hysterectomy* may be employed and the tubes removed, clamps or ligatures being used (*v.* under Vaginal Hysterectomy). This method is hampered often by want of operative space. The same objection may be urged against *posterior colpotomy* (section through posterior fornix into pouch of Douglas) and *anterior colpotomy* (section through anterior fornix into vesico-uterine peritoneal pouch).

Vaginal Hysterectomy.

The better method, and one where all necessary space and convenience for operating can be had is:—

Abdominal Section.

(b) *Abdominal Section.*—The general directions for the performance of abdominal section are given in the chapters on Ovariotomy and Abdominal Section. Here we refer only to the special features of the operation for removal of the tubes. After all preliminary preparation, antiseptic precautions, and the administration of an anæsthetic, the abdomen is opened in the middle line, a four-inch incision being made.[1] The operating table is now swung so that the head of the patient is lowered and the pelvis elevated, the angle varying according to necessity from 18° to 45°. Often after a marked inclination has been given, the return to a lessened one will not alter the position of the intestine. A large sterilised swab is now passed into the abdomen so that the intestines are separated by it from the pelvic viscera. One can thus look into the pelvis and see clearly the organs, normal and altered, in all their relations, and the field of operation is made more accessible. If the operator determines to remove the tubes and ovaries he proceeds as follows. All adhesions are separated by pressure of a swab, or by the finger when slight. Double catgut ligatures and cutting between may be necessary. The relations of the appendix should be ascertained and special care taken with adhesions in its neighbourhood. If the tubes and ovaries can be brought up to the wound a mass ligature, silk or catgut, may be applied. The broad ligament is transfixed with a double thread; this is divided, and the ligatures interlocked and tied on each side. The pedicle is held up by forceps applied above the ligature and the mass cut off above the forceps. Some operators prefer rather to ligature the tube at the uterine end, thus securing the ovarian artery, and then to tie the broad ligament at the infundibulo-pelvic ligament, where the ovarian enters the broad ligament. The ovarian ligament is also tied with catgut and then the tube and ovary cut away. Any bleeding points are attended to and the raw edges of the ligament between the two ligatures brought together with a running catgut suture. The other side is, if necessary, treated in the same way. The swab is now removed, the field of operation inspected, all bleeding accurately arrested, and the abdomen closed. If pus should escape from the tube during operation, when the patient is in the Trendelenburg position, the greatest care should be taken to wipe up all discharge and prevent its soiling the viscera. It is best to drop the table back as soon as possible, apply a fresh swab, and cleanse the hands or renew the gloves used. At the end of the operation warm salt solution should be poured into the pelvis, sponged out, and a large quantity of solution thus used.

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[1] When the operation is likely to be a simple one and much space not required, the transverse incision through skin and superficial fascia may be used, see chapter on Abdominal Section.

Conservative Operations.

In some cases it may be found possible to remove the diseased tube without interfering with the ovary. In such cases the latter should not be removed if it is healthy. Instead of removing the whole tube, the diseased part alone may be resected.[1] The object of leaving the sound portion is to conserve the function of pregnancy, and some interesting cases have been recorded of this. This has occurred after the removal of the tube and ovary of one side, and a portion of the tube on the other, the stump of the tube being sufficient to carry the ovum to the uterus. It has also occurred after the removal of the tube from one side and the ovary from the other—the ovum from the right ovary, reaching the uterus by the left tube.

On the other hand, in bad cases Faure and Kelly have worked out a method of splitting the uterus from the fundus down, cutting across at the os internum, and removing the tubes and ovaries along with each half. The procedure employed in supravaginal amputation of fibroids (retroperitoneal treatment of the stump, *v.* chapter on Treatment of Fibroids) may be also used in such cases.

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[1] Kelly: Vol. II., p. 188, where the arguments for conservative treatment are well given, with illustrative cases.

CHAPTER XXI.

MALFORMATIONS OF OVARY: OVARITIS: PERIOVARITIS: HERNIA, PROLAPSUS: OPERATIONS FOR REMOVAL OF APPENDAGES.

LITERATURE.

Barnes—Diseases of Women, p. 297; Lond., 1878. On Hernia of the Ovary, and Observations on the Physiological Relations of the Ovary: Am. J. of Obst., XVI., p. 1, 1883. *Engelmann*—The dry Treatment in Gynecology: Amer. Jour. of Obst., June and July 1887. *Englisch*—Oesterr. Med. Jahrbuch, 1871, p. 335; or Sydenham Year Book, 1871-72, p. 293. *Freund*—Die Lage und Entwickelung der Beckenorgane: Breslau, 1863. *Griffith*—Tubercle of the Ovaries: Tr. Path. Soc., London. Vol. XL. Gives literature fully. *Hermann*—Prolapse of the Ovaries: Med. Times and Gazette, 22nd October 1881. *His*—Die Lage der Eierstöcke in der weiblichen Leiche: Archiv für Anatomie und Physiologie, Anat. Abtheilung, 1881. *Klob*—Pathologische Anatomie der weiblichen Sexualorgane: Wien, 1864. *Langton*—Hernia of the Ovary: St. Barth. Reports, Vol. XVIII., p. 198. *Lebedinsky*—Ovarien bei Scharlach: Centralb. f. Gyn. I. *Martin*—Krankheiten der Ovarien: Besold, Leipzig, 1897. *Mundé*—Prolapse of the Ovaries: Am. Gyn. Tr., 1879, p. 164. *Olshausen*—Die Krankheiten der Ovarien: Billroth's Handbuch, Stuttgart, 1879. *Schultze*—Zur Kenntniss von der Lage der Eingeweide im weiblichen Becken: Arch. f. Gynäk. Bd. ix. S. 262. *Slavjansky*—Die Entzündung der Eierstöcke: Arch. f. Gyn. Bd. iii. S. 183. *Stratz, C. H.*—Gynäcologische Anatomie. Circulationsstörungen und Entzündungen der Ovarien und Tuben: Kornfield, 1892. *Sutton, J. B.*—Surgical Diseases of the Ovaries, etc.: Cassell & Co., London, 1896. *Tait, Lawson*—The Pathology and Treatment of Diseases of the Ovary: Birmingham, 1883.

We first take up some preliminary considerations.

Examination of Ovaries.

Palpation of Normal Ovaries.—After the student has had practice in the Bimanual, he will probably meet with some favourable case where he is able to feel the normal-sized ovary. This is best done as Schultze recommends. To map out the right ovary, use the index and middle fingers of the right hand internally and the left hand externally; for the left ovary, the left hand may be used internally and the right externally. The patient should lie on her back, with the knees drawn up and the thighs rotated outwards. This rotation of the thighs renders the psoas muscles tense, thus making their inner edges (which Schultze gives as a guide to the position of the ovaries) more easily palpable. Normally, they lie at about the level of the pelvic brim, half way between the

Fallopian-tube angle of the uterus and the psoas (*v.* pp. 25, 55). In special cases the ovaries can be easily made out by the recto-vaginal bimanual (*v.* p. 104).

MALFORMATIONS OF OVARY.

Malformation of Ovary.

Absence of one or both ovaries or rather their very rudimentary development is generally only part of maldevelopment of the other pelvic organs. Occasionally a third ovary is present—a fact worth keeping in mind in relation to Battey's operation (p. 232).

OVARITIS.

Ovaritis.

SYNONYM—Oöphoritis.

NATURE—An acute or chronic inflammation of the ovary.

Simple *Hyperæmia* of the Ovary may also occur.

PATHOLOGICAL ANATOMY.

Pathological Anatomy.

Acute ovaritis.—Of this we recognise two forms corresponding to the two subdivisions of ovarian tissue—the follicular or parenchymatous, and the interstitial. Stratz, however, states that these forms are always combined.

In the *follicular form*, the ovary is not much enlarged; but we find on microscopical examination the peripheral follicles increased in size, their contents turbid or purulent, the cells of the membrana granulosa and the ovum in a state of cloudy swelling. The zona pellucida becomes thickened and folded. Usually the surrounding tissue participates, though to a less marked degree, in the inflammatory changes; and in marked cases the germ-epithelium becomes cloudy and broken down, with fibrinous deposits on its surface.

Lebedinsky has examined the ovary in scarlet fever. To the naked eye, there was no change; but on microscopic examination, the Graafian follicles were found altered, with cloudy swelling or destruction of the epithelium. The younger follicles were most markedly affected, but the stroma was unaltered. In this way the follicles become destroyed and cicatrized, and the ovarian function thus greatly impaired.

In the *interstitial form*, the ovary is increased in size and its connective-tissue elements are proliferated. Pus may form, and often there are small apoplexies. Slavjansky speaks of the following varieties of the interstitial form: serous, suppurative, hæmorrhagic, and necrotic.

Chronic ovaritis.—As the result of this, we get destruction of the follicles and a cirrhotic condition of the organ, as was found in a case of Tait's examined by Doran. To the naked eye, the ovaries appeared markedly fissured on the surface. Occasionally the ovary remains distinctly large. Whether or not we get a super-involution of the uterus as the result of severe and double ovaritis, is not as yet settled. The ovaries may be small and cystic, and according to Tait this form gives rise to severe menorrhagia.

ETIOLOGY.

The causes of ovaritis are the following:— Etiology.

1. Chill at menstrual period;
2. Gonorrhœa, latent gonorrhœa in the male;
3. Instrumental exploration of the uterus;
4. Childbirth and abortion;
5. Acute febrile disease;
6. Pelvic peritonitis.

Gonorrhœa.—The ovaries may be inflamed secondarily, just as the testicles are in gonorrhœa of the male.

Instrumental exploration.—Sometimes after the passage of the uterine sound, the ovary becomes tender.

Childbirth and abortion.—This is a common cause of ovaritis. Thus, in 27 cases at Halle, Olshausen found the ovaries affected in 13. Usually both ovaries are implicated.

Acute febrile diseases.—Mumps, the exanthemata, septicæmia, and phosphorus and arsenic poisoning occasionally have ovaritis as one of their results.

Pelvic peritonitis.—It will readily be understood that ovaritis often occurs as part of general pelvic peritonitis.

The follicular form usually occurs in febrile diseases and pelvic peritonitis; the interstitial form is generally puerperal.

SYMPTOMS AND PHYSICAL SIGNS.

Acute ovaritis.—A case of simple acute ovaritis is not common. The patient usually complains of pain at the side radiating to the back, and of pain on pressure in the iliac regions. Symptoms and Signs.

When the Bimanual is made, the ovary or ovaries are unusually accessible, and are felt as mobile, tender, and somewhat enlarged bodies, often about the size of a walnut; and pressure causes great pain of a sickening character. Owing to adhesions, mobility may be wanting.

Chronic ovaritis.—The symptoms are pelvic pain, dysmenorrhœa, menorrhagia and sometimes sterility. Pain is felt in the ovarian region or pelvis generally, sometimes in one of the seats of sympathetic pain, *e.g.* below the breast. It is increased by whatever disturbs the ovary or causes congestion, *e.g.*, exertion, defæcation, coitus. Sometimes it is marked at the menstrual period—dysmenorrhœa. The menstrual flow is often increased, though the menorrhagia may be due to associated endometritis rather than the condition of the ovary. The symptoms resemble those of inflammation of the tubes, and the two conditions often go together. The physical signs are the same as in the acute form, with less tenderness on examination.

DIFFERENTIAL DIAGNOSIS.

Differential Diagnosis.

When the ovary is not fixed, there is nothing else with which it can be confounded.

PROGRESS AND RESULTS.

Progress and Results.

We may have resolution of the affection, adhesion, suppuration, and abscess. Sterility is a frequent result of double ovaritis; hysteria is often present.

TREATMENT.

Treatment when Acute.

Acute ovaritis.—A fly blister should be applied over the appropriate iliac region, and the hot vaginal douche frequently used. Bromide of potassium may be given as follows.

℞. Potassii Bromidi gr. xxx to ʒi.
Fiat pulv: tales xii.
Sig. One powder at night.

Treatment when Chronic.

Chronic ovaritis.—The hot douche and occasional blisters are best. The glycerine plug is of value.

Glycerine Plug.

A glycerine plug is made as follows: Take a thin square piece of absorbent cotton wool about the size of the palm of the hand; pour on its centre about ℥ss. glycerine; turn the corners over and squeeze the whole so as to saturate it; lastly, tie a piece of thread about 8 inches long round it. Pass Sims' or Fergusson's speculum, and place the plug in the fornix below the ovary. It should be left in for twelve to twenty-four hours, and then withdrawn and a vaginal douche given.

The plug may also be made of a piece of a thin sheet of cotton wool, 10 inches by 4, soaked in ichthyol and glycerine (1–20), twisted in rope-like fashion and with a tape attached at one end. Before passing any plug the vaginal walls should be wiped with cotton wool. The plug is then packed round the cervix and in the upper part of the vagina.

This plug reduces congestion, owing to the affinity of glycerine for water; has an antiseptic action; and, as we shall afterwards see, forms an admirable pessary. It sets up a watery discharge, so that the patient should be told to wear a diaper.

The tampon treatment combined with the use of the hot douche is a good routine treatment of chronic cases. Though the patient can carry it out herself, it is best done by a trained nurse. If the discharge it sets up be objected to, a dry tampon of non-absorbent cotton wool dipped in bismuth or any mild antiseptic powder may be substituted for the glycerine tampon. It may be passed with the aid of a speculum, and should be smeared at its upper part with vaseline. It does not become hard like the glycerine plug, and the elasticity of the non-absorbent wool is of benefit.

The following mixture is of use.

R.	Potassii Bromidi	ʒij.
	Potassii Iodidi	ʒj
	Inf. Gentian. Co.	ʒvi.

Sig. Tablespoonful thrice daily.

In menorrhagia uncontrollable by ordinary means, or where the patient's occupation or comfort is seriously impaired, the appendages may be removed (p. 232).

PERIOVARITIS.

Peri-ovaritis.

By this we understand an inflammatory affection of the tissues surrounding the ovary, which fixes the organ. It is a convenient clinical term for local peritonitic inflammations at the site of one of the ovaries. It is higher up than the usual cellulitic deposit. The treatment is the same as in chronic ovaritis.

DISPLACEMENTS OF THE OVARY—HERNIA.

Hernia of the Ovary.

The term *Hernia* is limited to those cases where the ovaries are present in the inguinal canals, in the obturator foramen (rare), or as part of an abdominal hernia. Percival Pott's case, where this first condition existed and where he excised both of the displaced organs, is the classical instance of this displacement. The usual form is where they are present in the *inguinal canal.*

ETIOLOGY.

Etiology.

The presence of ovaries in the inguinal canal is usually congenital, due to their descent along the unobliterated process of peritoneum. In 17 out of 23 cases, Englisch found it to be congenital; and in one-third of these, the hernia was double.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

Diagnosis.

An oval tumour of the size of the ovary, tender on pressure, is found in the inguinal canal. Its connection with the uterus may be demonstrated by drawing the latter down with a volsella.

It requires to be diagnosed from an ordinary hernia, and from hydrocele of the round ligament.

TREATMENT.

Treatment.

A protecting shield may be worn; and where very troublesome, the ovaries may be cut down upon and removed. Reduction is usually impossible, owing to adhesions.

PROLAPSUS.

Prolapse of Ovary.

We have already considered the support of the ovary. Its attachments to the broad ligament, to its own special ovarian ligament, and to the ovarian fimbria of the Fallopian tube, assist, but its chief support is the infundibulo-pelvic ligament of the Fallopian tube; in addition, its own specific gravity has an influence in determining its level. Its position is constantly changing. As the bladder fills, it is displaced backwards, and its lower end rises; during pregnancy, it is drawn upwards out of its pelvic position and becomes somewhat enlarged. The ovary is thus an organ liable to displacement, of which the most important is the *downward* one—known as *prolapse of the ovary.*

PATHOLOGICAL ANATOMY.

Pathological Anatomy.

The ovary lies lower than usual, in the lateral or in the true pouch of Douglas; the uterus may be in its normal position, but oftener it is retroverted. The ovary is usually enlarged, and often fixed by peritonitic adhesions.

Mundé considers the varieties of prolapsus as—

(1.) Retro-lateral, in the lateral pouch of Douglas;
(2.) Retro-uterine, in the true pouch of Douglas;
(3.) Ante-uterine, in the utero-vesical pouch, very rare;
(4.) In the infundibulum of an inverted uterus.

ETIOLOGY.

Etiology.

The conditions present in the puerperium favour displacement of the ovary for two reasons; the normal ascent of the uterus during pregnancy may stretch the ovarian and infundibulo-pelvic ligaments, and the ovary may not return to its normal size after parturition. Simple congestion of the organ may cause it to descend; and it is alleged that sudden jolts may also drive it below its normal site. It is not quite certain whether the congestion is cause or result. Probably it is the cause, but it is also aggravated by the displacement.

SYMPTOMS.

Symptoms.

These are radiating pains, pain on defæcation and coitus, a dragging sensation, reflex nervous symptoms with general irritability.

PHYSICAL SIGNS.

Physical Signs.

Bimanually, we feel in the true or in the lateral pouch of Douglas a small body or bodies, exquisitely tender and lying distinct from the uterus. By the rectal examination, the ovary is felt with unusual distinctness. Great care must be taken to be gentle in examination. Small cystic ovaries are often adherent, the adhesion being probably caused by rupture of the cysts, which may result from even gentle manipulation and cause aggravation of symptoms and fresh adhesions.

TREATMENT.

Treatment.

Blisters over the iliac region, hot vaginal douche, and bromide of potassium in fifteen-grain doses thrice daily. The bowels are to be opened by means of saline purgatives, such as the Friedrichshall water or Carlsbad salts. The following mixture is good :—

℞.	Magnesii Sulphatis	ʒvj.
	Quininæ Sulphatis	gr. xxiv.
	Acidi Sulph. dil.	ʒiij.
	Tincturæ Capsici	ʒj.
	Aquam ad	℥vj.
Sig.	Tablespoonful thrice daily.	

This relieves the congestion by unloading the bowels.

A course of treatment at Woodhall, or at Kreuznach or some other German Spa is often of service.

Often the prolapsed and non-fixed organ becomes, after a week of this treatment, distinctly higher in position. The glycerine plug or dry tampon is then of the utmost value.

In the chronic stage, when the uterus is retroverted and not fixed, the ring or the Albert Smith pessary is good if it can be borne (*v.* Retroversion of Uterus).

The cases where the tender ovaries are fixed low down by adhesions are exceedingly difficult to treat. When the uterus is retroverted and fixed and the ovaries below it, we get one of the most troublesome cases possible. Palliative treatment by blisters and the hot douche is best; if the case is not amenable to this treatment and the patient's general health is suffering, the propriety of removal of the appendages should be considered.

DEVELOPMENT OF OPERATIONS FOR REMOVAL OF THE APPENDAGES.

LITERATURE.

BATTEY'S OPERATION.—The literature on this operation is too extensive to be given in detail in a student's manual. The best summaries of cases are by Engelmann, Hegar, and Simpson. *Battey*—Battey's Operation: Transactions of International Medical Congress, Lond., 1881. See Am. J. of Obst., October 1881, for discussion. See also *Battey's Operation*: American System of Gynecology edited by Mann, Vol. II., p. 837. *Beatson, G. T.*—On the Treatment of inoperable cases of Carcinoma of the Mamma: Tr. of Med. Chir. Soc., Edinburgh, 1895-96. *Byford*—Removal of the Uterine Appendages, etc., by Vaginal Section: Am. Journ. of Obstet., 1888, pp. 337 and 872. *Engelmann*—The Difficulties and Dangers of Battey's Operation: Am. Med. Asso. Trans., 1878 (date of reprint). Battey's Operation, 3 fatal cases: Am. J. of Obst., July 1878. *Hegar*—Die Castration der Frauen: Volkmann's Sammlung, Nos. 136–138. *Simpson, A. R.*—History of a case of Double Oöphorectomy or Battey's Operation: Br. Med. J., May 24th, 1879. *Sims, J. Marion*—Remarks on Battey's Operation: Br. Med. Journal, 1877.

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It will ever be to the renown of Dr Battey of Georgia, U.S.A., that he first recognised that something required to be done towards the treatment of the unsatisfactory cases supposed to be due to chronic inflammatory diseases of the peritoneum and pelvic connective tissue. Sufferers from these conditions were allowed to drag on without help or sufficient investigation until Battey proposed to cure such by removing the ovaries so as to bring on an artificial menopause. His first operation was performed on August 17th, 1872, for severe dysmenorrhœa. On July 27th of the same year, Hegar of Freiburg had removed both ovaries, but did not publish an account of his case. Gradually Battey's example was followed by other operators, and Tait urged that the tubes should also be removed to check menstruation.

Plentiful operation has now demonstrated that inflammatory conditions of the ovaries and tubes are prevalent to an extent not even dreamt of before, and also that neither of the operations absolutely checked menstruation in all cases.

Operation in such cases is now considered necessary in order to remove diseased structures causing risk to bodily health, and not merely with a view to checking menstruation (*v.* Chapters XIX and XX.). For some time, certain indications for Battey's operation remained, viz.: removal of ovaries presumably healthy in order to check the hæmorrhage of certain bleeding fibroids; their removal to cure so-called ovarian dysmenorrhœa; also for certain forms of epilepsy, and hystero-epilepsy, but these are now neglected. Beatson of Glasgow has urged Battey's operation in inoperable mammary cancer, but the results are uncertain. Thyroid extract is usually given at the same time.

Nomenclature.—By Battey's operation we mean then, removal of ovaries presumably healthy, in order to bring on premature menopause. Tait's operation is removal of ovaries and as much of the tubes as can be grasped in the ligature, for the same object. Battey's operation has also been termed "normal ovariotomy" and "castration," but "oöphorectomy" is the best term of all those suggested, and is the only one now employed.

It is worth noting that Blundell of London proposed this operation in 1823, but no actual case was so treated.

For the details of the operation, the student is referred to p. 223, and to Abdominal Section in the Appendix.

CHAPTER XXII.

THE PATHOLOGY OF TUMOURS OF THE OVARY, PAROVARIUM, AND BROAD LIGAMENT.

LITERATURE.

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Origin of Ovarian Tumours.

THE somewhat complex subject of Ovarian Tumours will be best considered under the following heads:—

(1.) *Preliminaries;*

(2.) *Varieties of ovarian tumours, their naked-eye and microscopic anatomy;*

(3.) *The mode of origin of ovarian cysts;*

(4.) *Solid ovarian tumours, malignant tumours and the nature of the ascitic fluid associated with them.*

(1.) PRELIMINARIES.

We must first consider some points in relation to the development of the fœtus, and the anatomy and physiology of the ovary and adjacent structures. These we take up under the following divisions:—

(1.) Development of the genito-urinary organs;

(2.) Anatomy of the ovary;

(3.) Physiology of the ovary.

Development of Genito-urinary Organs.

(1.) *Development of the genito-urinary organs.* In the human fœtus there are two structures from which the future urinary and sexual organs are to be developed: these are the ducts of Müller and the Wolffian bodies with their ducts (figs. 43-48). In the female, the *ducts of Müller* form the Fallopian tubes, uterus, and upper two-thirds of vagina, the *urino-genital sinus* forming the lower third; the *Wolffian bodies* and ducts do not persist, but traces are found normally in the broad ligament forming the parovarium, while we may have further traces in the positions shown in fig. 109, as well as in the hilum of the ovary.

Anatomy of Ovary.

(2.) *Anatomy of the ovary.* For anatomical description we may consider the ovary as consisting of three parts, viz., the *hilum*, the *medulla* (*zona vasculosa*) and the *cortex* (*zona parenchymatosa*); the first containing traces of the Wolffian bodies, the second being the vascular part, while in the third, the characteristic structures known as the Graafian follicles with their ova are present (fig. 109). Another division is into oöphoron, paroöphoron, and epoöphoron (parovarium) (fig. 113). In regard to the development of the follicles, we have already stated that the passage of the germ epithelium which forms as a thickened layer on the Wolffian body into the substance of the ovary (the so-called Pflüger's tubes) gives rise to the ova and membrana granulosa. Foulis, however, held in 1878, and his view is now gaining ground, that the membrana granulosa is derived from the connective tissue of the ovary. He also stated, like Waldeyer, that the ova lay in the parenchymatous zone, owing to an outgrowth of the connective tissue of the Wolffian body into the epithelium. It is of importance to note that what are termed primordial follicles consist of an ovum with a

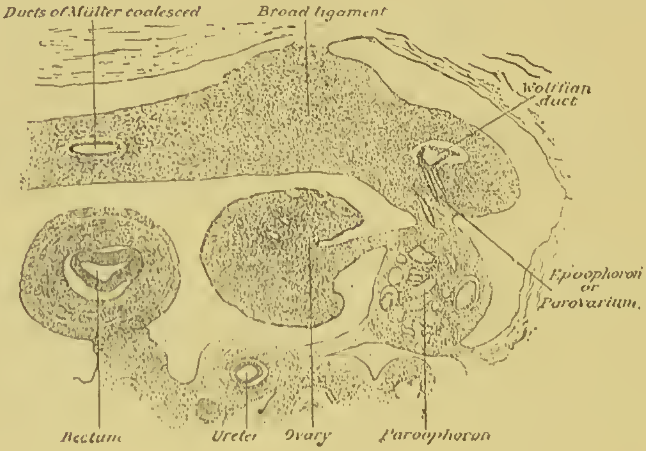

Fig. 113.

From Seven Weeks' Foetus ($\frac{8}{1}$).

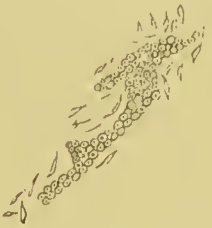

Fig. 114.

Cellular Bodies alleged by Waldeyer to be enclosed germ epithelium which has not developed into normal Graafian follicles. He believes these to be one source of ovarian tumours (*Nœggerath*).

thin envelope of flattened epithelium. The structure of the fully developed follicle is given at p. 28.

A section of a developed ovary shows, further, *cellular structures* (fig. 114), which (according to Waldeyer) are some of Pflüger's ducts that have not developed as they should have done into Graafian follicles, and which may give origin to ovarian cysts.

It must also be remembered that we have in the ovary a great variety of tissue, viz., fibrous and spindle-celled connective tissue, and unstriped muscle.

Physiology of Ovary.

(3.) *Physiology of the ovary.*—When we consider that every month in relation to menstruation, between puberty and the menopause a Graafian follicle distends and then ruptures, we are led to expect what really does sometimes occur, viz., that the follicle may not rupture but merely distend to form a pathological cyst. When pregnancy occurs, the ruptured follicle has its large corpus luteum—true corpus luteum—filling it; and in this also we may have pathological development. Of the 30,000 to 75,000 Graafian follicles contained in each ovary, only an insignificant number develop and rupture at the menstrual periods. Many of the rest atrophy, forming the corpora fibrosa which are seen on section as fibrous points and contain no vessels; it is alleged that these corpora fibrosa may originate also from ripe follicles or from follicles where there has been hæmorrhage.

Both the ovary and corpus luteum are stated to have an internal secretion, but our knowledge as to these is still very imperfect. It is a recognised fact that the removal of the ovaries cures malacosteon disease (Fehling); and it is possible that the corpus luteum internal secretion exerts a stimulating influence in developing the decidua in pregnancy, (*v.* Andrew's paper). It is worthy of note too that the corpus luteum is made up of large epithelial cells (the lutein cells) with a capillary network between the cells, and is thus anatomically favourably formed for the production and absorption of any internal secretion.

(2.) VARIETIES OF OVARIAN TUMOURS—THEIR NAKED-EYE AND MICROSCOPIC ANATOMY.

Varieties of Ovarian Tumours.

Various classifications of ovarian tumours have been given, but one of the best is that of Pfannenstiel which is as follows:

(A.) Tumours arising from the parenchyma of the ovary;
(B.) Tumours arising from the stroma;
(C.) Combination tumours.

In each group, and especially under tumours from the parenchyma, we have two sub-classes according as these arise; (1) from the epithelium—cystic and solid tumours; (2) from the ovum—dermoids and teratomata.

The solid tumours *arising from the stroma* will be considered at p. 243.

By *Combination tumours* we understand the association of dermoids, sarcomata or carcinomata with the multilocular adenomatous forms.

(A.) TUMOURS ARISING FROM THE PARENCHYMA OF THE OVARY.

These consist of:

(1.) The simple serous cyst (cystoma serosum simplex);
(2.) The adenomata (cystoma ovarii proliferum glandulare or cystadenoma pseudomucinosum);
(3.) The papillomata (cystoma ovarii proliferum papillare);
(4.) Dermoids and teratomata.

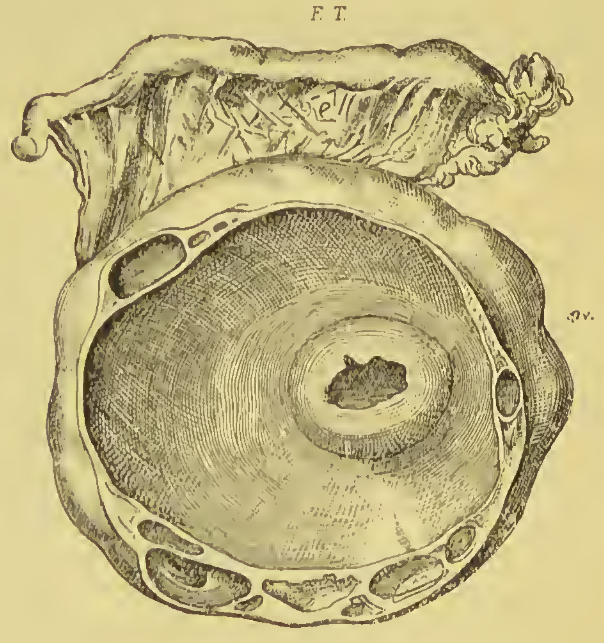

Fig. 115.

A Small Multilocular Ovarian Cyst, slightly reduced from natural size (Museum of the Royal College of Surgeons of England, Pathological Series, No. 275) (*Doran*).

(1.) *Simple serous cyst* (*cystoma serosum simplex*).—This is the old hydrops folliculi. It is not of a proliferating nature, and is usually single-cysted. The contents are serous with abundance of albumen, and are practically blood serum. No pseudomucin is present. The cysts are lined with a single layer of columnar epithelium. The pedicle is the same as in the following group.

(2.) *The adenomata* (*cystoma ovarii proliferum glandulare or cystadenoma pseudomucinosum*).—This is the ordinary cystic ovarian tumour and is the most common form of cystic tumour of the ovary (fig. 115).

Naked-eye anatomy.—The two chief parts are (*a*) the cyst, and (*b*) the pedicle.

(*a.*) *The cyst.* —This varies in size and may attain enormous dimensions, so that in some cases the patient has almost seemed an appendage to the tumour. The cyst is multilocular, and usually there is one very large cavity with numerous smaller ones of various sizes. The fluid contents are sticky, varying much in consistence and colour. Hammersten[1] and Pfannenstiel[2] have shown that the clear tenacious fluid present in the small cysts consists chiefly of a substance which resembles mucin in many respects, except that it is not soluble in acetic acid. Hence they have called it pseudomucin. When boiled with diluted hydrochloric acid, sugar is separated, which can be detected by Fehling's solution. Pseudomucin is, therefore, a glycoproteid.[3] It is secreted by the epithelium lining the cyst (*see* fig. 117).

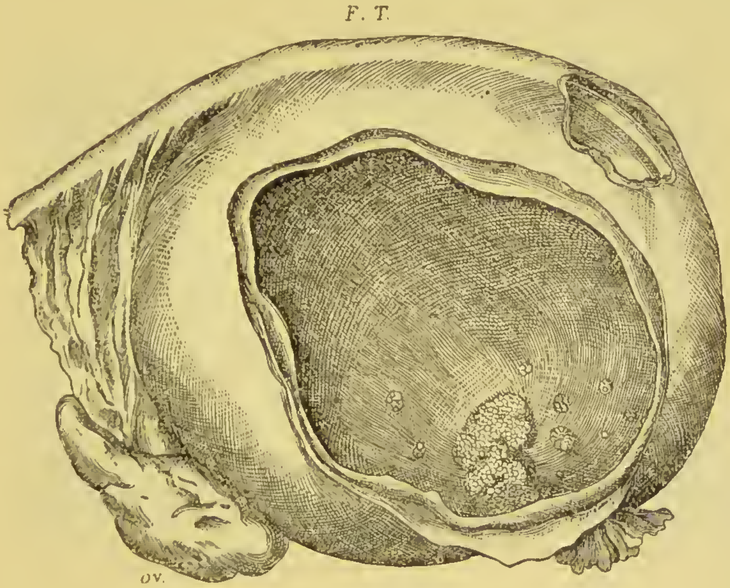

FIG. 116.

A LARGE PAPILLOMATOUS CYST springing from the Hilum of the Ovary, the greater part of which organ is not involved in the morbid growth. The cyst has forced its way between the layers of the broad ligament as far as the Fallopian tube; this condition has been made more clear by removal of a part of the ligament over the tube, and another part over the cyst; the corresponding portion of the wall of the cyst has also been taken away to expose the cavity (*Doran*).

The corpuscular elements vary but we may have oil globules, cholesterin, blood and large granular cells, degenerated leucocytes, or the nuclei of the columnar cells which line the cyst, and varying from $\frac{1}{5000}$ to $\frac{1}{2000}$ in. They used to be considered as characteristic of ovarian fluid (Drysdale's or Bennett's corpuscles) but are not so. The specific gravity of the fluid varies from 1010 to 1020.

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[1] *Zeitschrift f. phys. Chem.*, 1882.

[2] *Archiv f. Gynäk.*, Bd. xxxviii. He describes three varieties of pseudomucin, differing in solubility in water, specific gravity and alkalinity.

[3] The association of sugar in the urine with ovarian tumours in cases reported by Croom and Beyea has raised the question whether there is any causal relation between them. Beyea—*Pseudomucinous cyst associated with Diabetes:* "Am. Journ. of Obstet.," 1900, p. 145.

The cyst wall has cubical or flat cells outside, not peritoneum; the thickness of the wall is made up of lamellæ of fibrous tissue, and we have lining the cyst the columnar epithelium already alluded to (fig. 117). Sometimes the cysts may remain uncoalesced, like a bunch of huge grapes—Rokitansky's tumour. Tait, Winckel and Olshausen have recorded such.

(*b.*) *The pedicle* consists practically of broad ligament drawn out by the growing tumour. The inner margin is Fallopian tube, its outer the infundibulo-pelvic ligament, while the ovarian ligament is also a constituent. The ovarian artery is at the tubal and infundibulo-pelvic edges, and when these and the artery to the ovarian ligament are secured all bleeding is practically controlled.

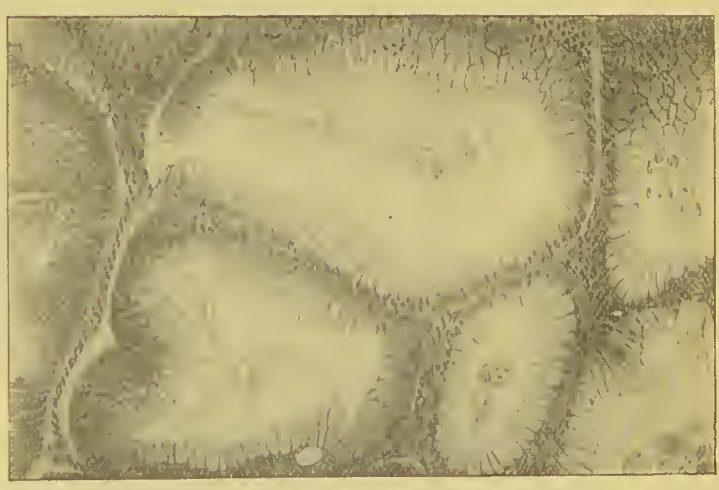

FIG. 117.

LOCULI OF AN OVARIAN ADENOMA with epithelium laden with pseudomucin (*Bland Sutton*).

Pseudo-myxoma Peritonei.

In some cases of ruptured ovarian cyst it has been pointed out by Werth that, in addition to the presence of the gelatinous cyst-contents among the abdominal viscera, we may get a special condition of the peritoneum set up to which he gives the name *Pseudomyxoma Peritonei.* In one case microscopic examination of the altered peritoneum showed small-celled infiltration, and extension of blood-vessels as a network through the gelatinous layer so that the latter came to lie in spaces.

Donat has also recorded a case operated on by Sänger, analogous to those recorded by Werth, where recovery took place. He urges with good reason that the so-called "Pseudomyxoma Peritonei" is simply peritonitis set up by the irritation of the effused cyst contents (Fremdkörper Peritonitis). Pseudomyxoma peritonei may thus be a mere distribution condition following rupture, but some regard it as capable of metastasis. Both views can be substantiated from cases from most operators.

(3.) *The Papillomata* (*cystoma ovarii proliferum papillare*).—This may be a separate form of tumour with the papillomatous condition lining the cyst (fig. 116), and may be found as part of the ordinary ovarian tumour, or the papillomata may be on the surface of the tumour and not inside.

The characteristic of these cysts is the papillary, tag-like projections, consisting of a core of connective tissue covered with columnar epithelium (fig. 118) often degenerated, and with sometimes mucous tissue in the core.

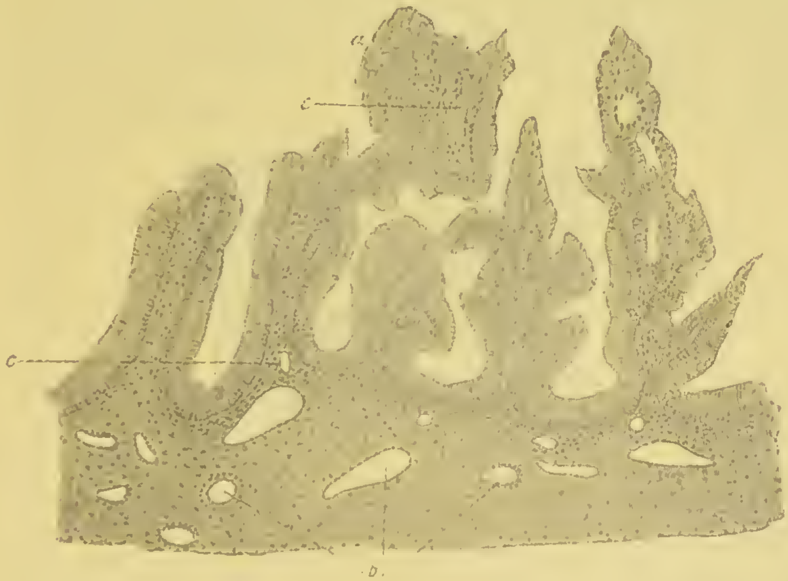

Fig. 118.

Section of Papillary Ovarian Cyst Wall. The papillæ are covered with columnar cells which at *a* are cut transversely; *b*, blood-vessels in cyst wall; *c*, same in papillæ (*Pfannenstiel*).

The fluid of the papillomatous form is usually watery and serous.

As we shall see afterwards the papillomatous tumours are very apt to develop extra-peritoneally and not to be pedunculated. This will be discussed afterwards.

(4.) *Dermoids and Teratomata.* — Dermoids are tumours arising abnormally from the germ layers. The true dermoid is usually part of a cystic ovarian tumour, while the teratomata are solid and are more of the nature of new growths from germ layers.

The dermoid usually forms part of a cystic tumour, and is limited to a more or less prominent portion covered with cutis and termed "Zotte" by Wilms, who has a special theory as to the nature of dermoids. According to him they are developed from a primordial ovum, which has undergone a change analogous to parthenogenesis, *i.e.*, there is partial development and production of parts of an embryo, usually the cephalic end, without, of course, fertilisation. Whether Wilms' theory is right or not, the condition produced is very remarkable. Elements produced from all the germ layers, but not the entoderm according to some, may be present (skin, hair, teeth, bone, striped muscle, nervous tissue, upper and lower jaw, cholesterin, finger, mammæ and other glands, intestine, uterus) with yellow fluid, salad-cream like in appearance. Wilms' theory is one of the best, but we must also bear in mind that as the Wolffian body, in connection with which the ovary develops, and into the stroma of which it sends processes, as well as the Wolffian duct, is developed from the ectoderm, we may thus get in the ovary relics of an ectodermic origin. Unless we take Wilms' theory, it is difficult to understand how entodermic structures are found in dermoids, while of course it is most difficult to understand what stimulus should make a primordial ovum undergo the extraordinary development of a dermoid.

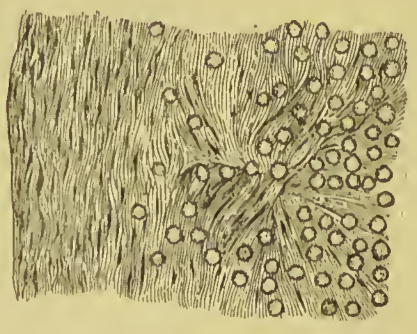

FIG. 119.

ROUND-CELLED SARCOMA FROM A DERMOID CYST, showing the transition from the connective tissue of the firmer portion of the tumour to the collection of round cells, with a trace of fibrillation of the intercellular substance in the softer portion of the tumour (*Doran*).

According to Holländer, teeth when present have their crowns sloping slightly towards the median plane of the body, and thus the side of the body from which the tumour arises may be ascertained.

Teratomata are solid dermoids, less regular in their development, and malignant or suspicious in nature.

(3.) MODE OF ORIGIN OF OVARIAN CYSTS.

Mode of Origin of Ovarian Cysts.

The mode of origin of ovarian cysts is much disputed. The following is a brief summary of the views at present held.

Simple serous ovarian cysts (*cystoma serosum simplex*) may be considered as arising from distended Graafian follicles.

The multilocular cysts or adenomata may be considered as arising from ovarian epithelium. This is found in connection with the Graafian follicles, developed or undeveloped, in their membrana granulosa, and in the superficial layer of germ epithelium covering the ovary, the former giving rise to the pseudomucinous cysts, and the latter, according to some, passing into the ovarian substance in a tubular fashion, originating the adenomata with serous fluid.

The papillomata arise from the remains of the Wolffian tubules at the hilum of the ovary (Plate VII., fig. 2), or from the germ epithelium, or even Fallopian tube epithelium.

Dermoids and teratomata arise from the Wolffian body or duct epithelium (of ectodermic origin) in ovary or broad ligament. According to Wilms, they are really primordial ova with a development short of actual parthenogenesis but akin to it.

Less probable sources of cysts are from the epithelium of degenerated blood-vessels (Nœggerath), or from colloid degeneration of the stroma.

(4.) SOLID OVARIAN TUMOURS; MALIGNANT TUMOURS AND THE NATURE OF THE ASCITIC FLUID ASSOCIATED WITH THEM.

Solid and Malignant Tumours.

These tumours form group B of Pfannenstiel's classification (*v.* p. 237).

Non-malignant (solid) tumours are rare. Myoma of the ovary (fig. 120) has been described by Doran, the origin of which he traces to the muscular fibres of the ovarian ligament;[1] and Cullingworth has reported an interesting case of fibroma of both ovaries (Desmoid tumours).

The whole ovary may be converted into the tumour—no trace of ovarian substance being found—or a portion of the ovary may be found either spread out on the surface of the tumour or pushed to one side by its growth; more rarely does it spring by a pedicle from the ovary. Besides its hardness and whorled appearance on section, the presence of a capsule (as in fibroid tumours of the uterus) is characteristic.[2] They rarely show calcification.[3]

The ovary may be enlarged by the presence of small fibrous nodules arising probably from undeveloped Graafian follicles; they have been termed gyromata.

We may also have the form of tumour known as endothelioma. It probably arises from the lymphatic endothelium. The solid tumours are usually small in size.

Malignant disease of the ovary is a comparatively frequent occurrence. It often complicates cystic degeneration, specially in the papillary form of ovarian cyst. It arises also independently, and may occur either as primary Carcinoma or Sarcoma. Fig. 124 shows the character of the growth in a case of scirrhus of the ovary in a girl aged fifteen, described by Thornton and Doran.

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[1] "Lond. Obstet. Trans.," 1902, p. 168

[2] Fairbairn: "Lond. Obstet. Trans.," 1902, p. 177.

[3] Cases by Pokrovsky and Bact.: "Brit. Med. Journ.," 1900, Vol. II., Epitome, pp. 91, 95.

Rare tumours are angiomata, enchondromata and myxomata. Sarcoma is relatively rare, forming only 14 per cent. of the cases of malignant ovarian tumours.[1] It may occur both in the spindle-celled and alveolar forms. The spindle-celled (fig. 121) forms a transition from the simple fibro-myomatous tumour to the alveolar sarcoma (fig. 122). Cases of primary melanotic sarcoma have been recorded by Andrews (*Lond. Obstet. Trans.*, 1901, p. 228) and Amann (*Brit. Med. Journ.*, 1903, 1., epitome 26).

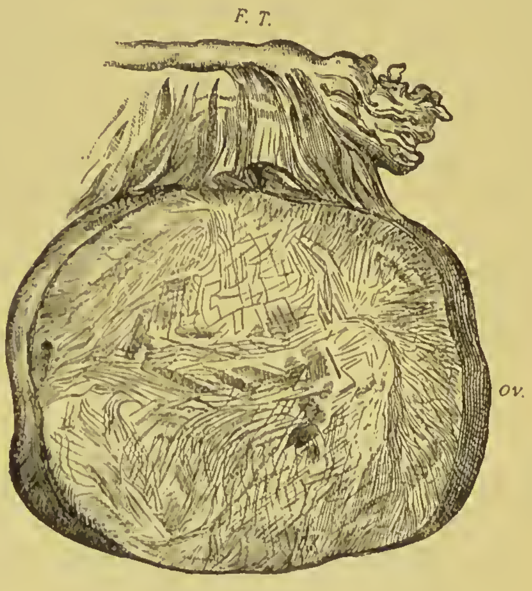

FIG. 120.

MYOMA OF THE OVARY (*Doran*).

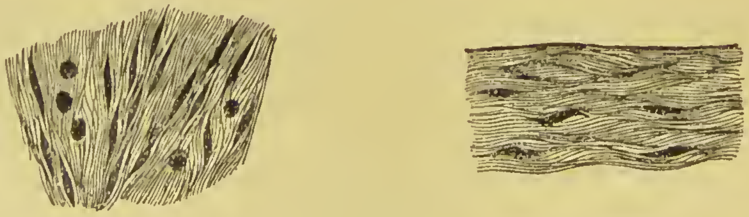

FIG. 121.

SPINDLE-CELLED SARCOMA OF THE OVARY, showing the superficial and the more central part of the tumour (*Doran*).

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[1] Out of 1106 cases collected by Russell and Schenck: "Am. Journ. of Obst.," 1902, p. 182.

Foulis' Researches.

An important feature is the rapid development of ascites, without the existence of cardiac, hepatic, or renal disease to explain it. Of some importance are the cells in the ascitic fluid associated with malignant ovarian disease. Foulis investigated this subject, and brought out results of great value. We reproduce at fig. 123 some of these cells which he described as follows.

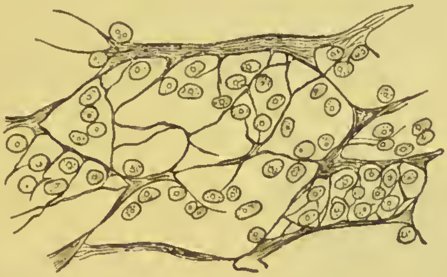

FIG. 122.

ALVEOLAR SARCOMA OF THE OVARY (*Doran*).

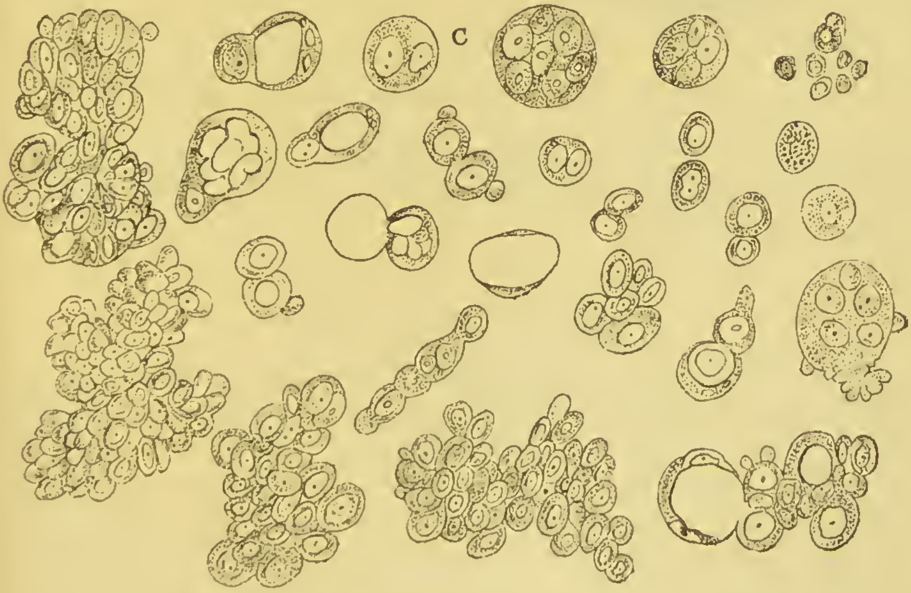

FIG. 123.

CELL-GROUPS from ascitic fluid surrounding malignant omental tumour (*Foulis*).

> "Cell groups found in the deposit from ascitic fluid surrounding a large flat or pancake-shaped tumour of the omentum. The tumour was thought to be ovarian. In the fluid in the pleural sacs exactly similar cells and cell groups were seen, and the pleural surface of the diaphragm was studded over with cancerous nodules.

The cell groups and cells were drawn by the aid of the camera lucida under a power of 350 diameters, with No. 3 ocular."

It is probable that these liberated cells found in ascitic fluid graft themselves on the peritoneum, and pass through the diaphragm into the pleura and pericardium.

A tuberculous condition of the ovary is found occasionally as part of general tuberculosis. According to Griffith the ovary is affected with miliary tubercle, either superficially or deeply. The latter may caseate and go on to abscess. We may also, though very rarely, have actinomycosis (*v.* p. 161).

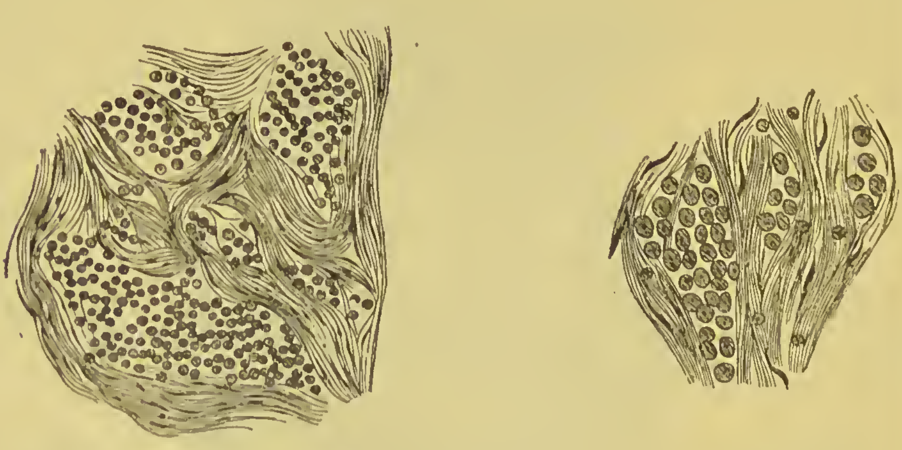

Fig. 124.

Cancer of the Ovary (2-inch and ⅛-inch objectives) (*Doran*).

PAROVARIAN CYSTS.

Parovarian Cysts. These tumours, almost invariably unilocular, are developed from the parovarium (epoöphoron), have a separable peritoneal covering, are thin-walled, and contain a watery fluid which is little more than a mere solution of salt. They may contain papillomatous growths, however, owing to their Wolffian origin—an argument for their being always removed by abdominal section. Small parovarian tumours are common, but they may also be of large size. They are seldom lined by ciliated epithelium, but usually by cubical or squamous cells, the flattening being, according to Spiegelberg, due to pressure of contents. They are usually pediculated, like the ordinary ovarian, but may develop extra-peritoneally.

It must be remembered of course that all cysts of the broad ligament are not parovarian in their origin. Parovarian cysts are in the site of the parovarium, with the ampullary portion of the tube and the ovarian fimbria stretched and the ovary intact (*v.* Pl. VII.).

PLATE VII.

Fig 2

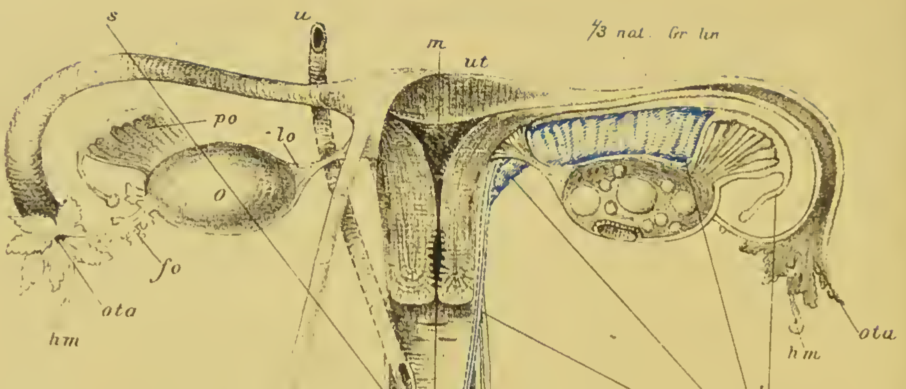

Fig 3

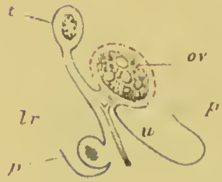

Fig. 1

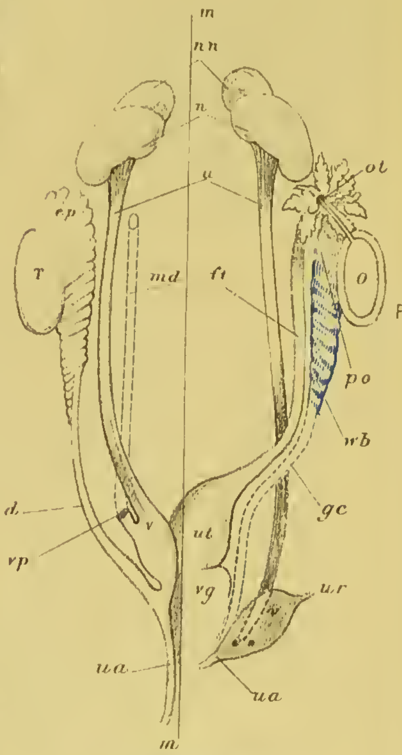

Fig 4

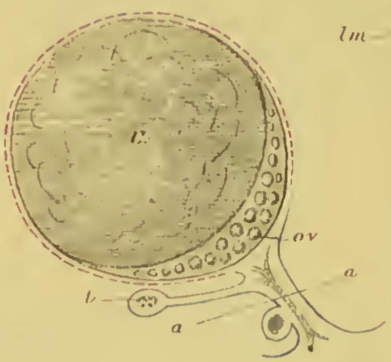

Fig. 5

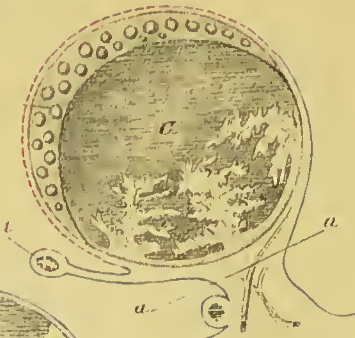

Fig 6

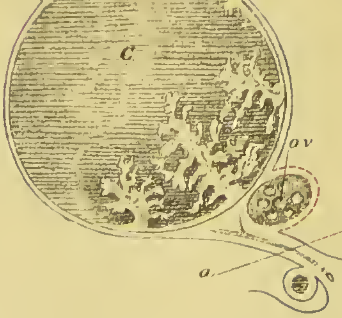

Fig 7

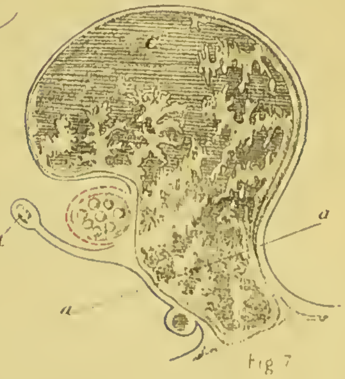

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DIAGRAM OF MODE OF ORIGIN AND GROWTH OF MULTILOCULAR AND PAPILLOMATOUS OVARIAN TUMOURS (COBLENZ).

OTHER BROAD LIGAMENT CYSTS (PAROVARIAL CYSTS).

Parovarial Cysts.

By these we mean cysts developed in the broad ligament, but not from the ovary or parovarium (fig. 125). They are, however, identical in origin with Parovarian cysts, as they arise from Wolffian relics[1]; further they are usually papillomatous.

The direction of development of these tumours is of great practical interest as they may spread within the folds of the ligament towards the side of the pelvis, towards the uterus, or down in the direction of Douglas' pouch. This renders their removal troublesome as they have then to be enucleated, owing to the absence of a pedicle (*v.* Plate VII.)

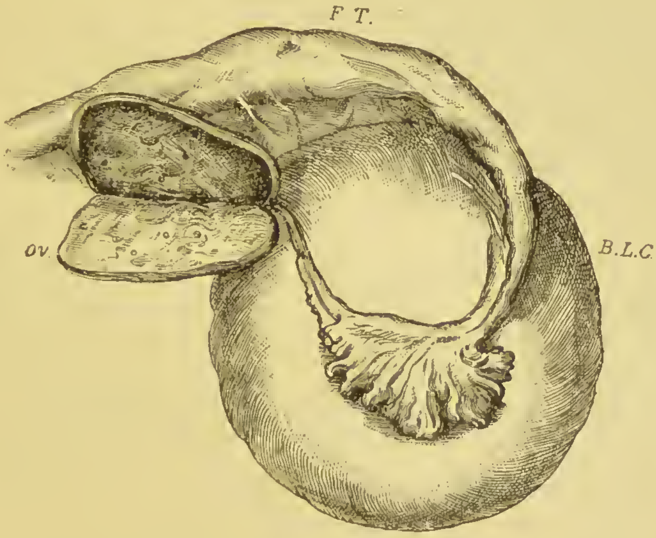

FIG. 125.

A SIMPLE BROAD LIGAMENT PAROVARIAL CYST (*Doran*).

Ov. Ovary split open ; *F.T.* Fallopian tube ; *B.L.C.* Broad ligament cyst.

These cysts may rupture and cause infective papillomatous growths of peritoneum and ovary.

Plate VII. from Coblenz will be helpful to the student in enabling him to understand the genesis of ovarian tumours, and will also show him the value of a knowledge of development in clearing up the origin of disease.

Fig. 1 shows diagrammatically the development of the urinary and generative organs in the human fœtus—female organs (chiefly developed from the ducts of Müller while the Wolffian bodies are rudimentary) shown to the right of the line *m*, and male organs (chiefly developed from the Wolffian bodies while the ducts of Müller are rudimentary) to the left. The rudimentary organs are coloured blue in the figure. On *both* sides, we have *nn* supra renal capsule, *n* kidney, *u* ureter, *v* bladder, *ua* urethra; to the *right* (female organs) are *O* ovary, *po* parovarium, *wb* part of Wolffian body not forming parovarium, *gc* Wolffian duct persisting in Gartner's canal, *ot* fimbriated end of tube, *ft* Fallopian tube, *ut* uterus, *vg* vagina, *ur* urachus; to the *left* (male organs) are *T* testis, *ep* epididymis, *vd* vas deferens, *md* duct of Müller rudimentary down to *vp* vesicula prostatica.

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[1] Cysts have also been described as arising from adrenal remains which, by abnormal development, have come to be included in the broad ligament (Pick : "Beiträge z. Geb. u. Gyn.," 1901. Eastwood : "Brit. Med. Jour.," 1902, 1, p. 80).

Fig. 2 shows the fully-developed generative organs in the female: on the left, the organs found in the normally developed female are given; while on the right, the coloured portion shows the rudimentary structures from which there may be pathological development. On the left, the broad ligament is supposed to have been removed; on the right, the organs are shown in coronal section ($\frac{1}{3}$ nat. size); *ota* ostium tubæ abdominale, *hm* hydatis Morgagni, *fo* ovarian fimbria, *O* ovary, *lo* ovarian ligament, *po* parovarium, *lr* round ligament, *vg* vagina, *wv* upper wall of vestibule, *cc* corpus cavernosum clitoridis, *u* ureter, *l* labium minus, *lm* labium majus; *wb* Wolffian body in its special separate parts as follows:—

Segment I. parovarium, II., III., IV. normally obliterated parts of Wolffian body and duct. From II. we may get cysts of broad ligament developing, as well as papillomatous ovarian ones. From the duct (III. and IV.), we may get cysts of cervix uteri and vagina.

Fig. 3 shows a section (in line *ss* fig. 2) of broad ligament, Fallopian tube, and ovary. The blue line *pp* is the peritoneum, *u* being posterior layer of broad ligament; the red one, the germ epithelium of ovary; *t* tube, *ov* ovary, *lr* round ligament.

Fig. 4 shows development of ordinary multilocular tumour; *C* cystic and *o v* solid parts of tumour; *a a* line of section when tumour is removed; other letters as before.

Fig. 5 shows a tumour which is multilocular and papillomatous, the latter feature caused by Wolffian remains at hilum of ovary.

Fig. 6 shows papillomatous tumour of the parovarium developing in broad ligament, the ovary being intact.

Fig. 7 shows papillomatous cyst extending within the layers of broad ligament developed from remains of Wolffian body and pushing up posterior layer of broad ligament (*cf* fig. 3, *u*).

The student will see by comparing figs. 3, 4, 5, 6, and 7, how glandular and papillomatous cysts alter the relations of structures in the broad ligament. He will also understand the formation of the pedicle (*v.* figs. 4, 5, and 6), as well as the necessity for enucleation in such a case as fig. 7 represents.

CHAPTER XXIII.

DIAGNOSIS OF OVARIAN TUMOURS.

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For convenience we take up the diagnosis and differential diagnosis of ovarian tumours under three heads:—

A. When small (pelvic in position);
B. When large, multilocular, and pedunculated (chiefly abdominal in position);
C. When large and extraperitoneal (often papillomatous).

A. WHEN SMALL (PELVIC IN POSITION).

These may be either (*a*) Lateral to uterus, (*b*) Posterior to uterus, or (*c*) in front of uterus.

(*a*) *Pelvic Ovarian Tumours lateral to Uterus.*

Diagnosis of Ovarian Tumours when pelvic and lateral to Uterus.

1. *Symptoms.*—These are chiefly those of pressure and bearing down, and have no diagnostic value. There is no menorrhagia.

2. *Physical signs.*—Palpation and percussion give evidence of the presence of a tumour only when it projects above the brim. Auscultation gives negative results. On vaginal examination, the cervix

is found displaced to the side opposite to that on which the tumour is. Through the fornix a tense, rounded, fluctuating mass is felt projecting downwards. Bimanually the uterus is felt not enlarged, but is displaced to one side, and is distinct from the tumour, which can be mapped out between the hands. Usually the uterus and tumour are not very movable, owing to the limited space of the pelvic cavity.

3. *Differential diagnosis.*—When *lateral* to the uterus, they require to be differentiated from the following:—

(1.) Pelvic cellulitis;
(2.) Pelvic peritonitis (encysted serous effusions);
(3.) Parovarian cysts;
(4.) Hydrosalpinx, Pyosalpinx;
(5.) Fallopian-tube gestation;
(6.) Fibroid and fibro-cystic tumours of uterus;
(7.) Blood effusion;
(8.) Solid ovarian tumours.

(1.) *Pelvic cellulitis.*—With this we have a history of inflammation and of probable cause (as abortion or labour) to guide us. When the cellulitis has gone on to suppuration, there will be rigors and other indications of suppuration. Cellulitic deposits, unless when in the inner part of the broad ligament, are always fixed; are firm when not purulent, and even when purulent do not give very distinct fluctuation.

(2.) *Pelvic peritonitis.*—This unless serous will not cause the fornix to bulge downwards, and the history will help us. Tapping gives serum, and not ovarian fluid. When an ovarian tumour is fixed by peritonitic adhesions, it will be almost impossible to diagnose it from encysted pelvic peritonitic effusion except by examination of the fluid.

(3.) *Parovarian cysts* are not so rounded, and have very distinct fluctuation; their secretion is usually simple salt and water.

(4.) *Hydrosalpinx and pyosalpinx* are high in the pelvis, tortuous and elongated from side to side.

(5.) *Extra-uterine gestation.*—The symptoms and signs of pregnancy with a tumour beside the uterus corresponding to the period of amenorrhœa (sometimes masked, however, by irregular hæmorrhages from the uterus) point to extra-uterine gestation (*see* also Chap. XVIII.).

(6.) *Fibroid and fibro-cystic tumours of uterus* (*v.* Section V.).

(7.) *Blood effusion* in the broad ligaments is more difficult to diagnose during life, but sudden onset with history of fainting and pallor are found (*v.* Chap. XVIII.).

(8.) *Solid ovarian tumours* are rare. When malignant, there are often nodules in the fornices and ascitic fluid which may contain the cells shown at fig. 124.

(*b*) *Pelvic Ovarian Tumours posterior to Uterus.*

Diagnosis of Pelvic Ovarian Tumours when small and posterior to Uterus.

1. *Symptoms.*—The most pronounced ones are associated with urination, there may be either retention or constant desire to micturate. There is no menorrhagia.

2. *Physical signs.*—Palpation, auscultation, and percussion give the same result as when the tumour is lateral. On bimanual examination the uterus is felt markedly displaced to the front, but is not enlarged; and bulging downwards behind the cervix, the round globular cystic ovary can be grasped between the hands. Tapping gives ovarian fluid.

Differential diagnosis.—When *posterior* to the uterus, they require to be differentiated from the following conditions:—

(1.) Encysted serous peritonitic effusion;
(2.) Retro-uterine hæmatocele;
(3.) Fibroid and fibro-cystic tumours of the uterus;
(4.) Retroverted gravid uterus and extra-uterine gestation;
(5.) Parovarian cysts.

(1.) *Peritonitic effusion* has an inflammatory history; it is not so rounded nor so well defined above. The fluid is serous.

(2.) *Retro-uterine hæmatocele* has, after the blood has coagulated, a hard feeling, and is more expanded transversely. There is a history of sudden onset, menorrhagia, and subsequent inflammatory symptoms.

(3.) *Fibroid and fibro-cystic tumour of the uterus* (*v.* Section V.).

(4.) *Retroverted gravid uterus and extra-uterine gestation.*—In both of these there will be the signs and symptoms of pregnancy; the amenorrhœa in the latter case may be masked by hæmorrhages from the uterus.

(5.) *Parovarian cysts.*—The character of the fluid is our only certain guide.

It should be specially noted that these pelvic ovarian tumours are apt to cause *pelvic inflammation*, and thus render the exact diagnosis very difficult.

(*c*) *Pelvic Ovarian Tumours in front of Uterus.*

Ovarian Tumours in front of Uterus.

The *symptoms* and *physical signs* are similar to the foregoing, with the exception that the uterus lies behind the rounded cyst and is retroverted

As regards *differential diagnosis* we note that effusions and tumours in the utero-vesical pouch are comparatively rare. The possibility of the tumour being the distended bladder can easily be excluded by passing the catheter. Tumours in this situation are frequently dermoids, but not invariably, as Küster stated.

B. DIAGNOSIS OF OVARIAN TUMOURS WHEN LARGE, MULTILOCULAR, AND PEDUNCULATED (CHIEFLY ABDOMINAL IN POSITION).

Diagnosis when large.

1. *Symptoms.*—These are chiefly due to its bulk. The patient's notice is attracted to the fact that she is getting rapidly stout.

2. *Physical signs.*—When the patient lies on her back and the abdominal surface is exposed, the following points can be noted :—

On *inspection* the abdomen is seen to be greatly distended. The distension may be uniform, but is often more or less markedly lateral. The distance from the anterior superior spinous process to the umbilicus is greater on one side than the other. The superficial abdominal veins may be dilated, and lineæ albicantes are sometimes present.

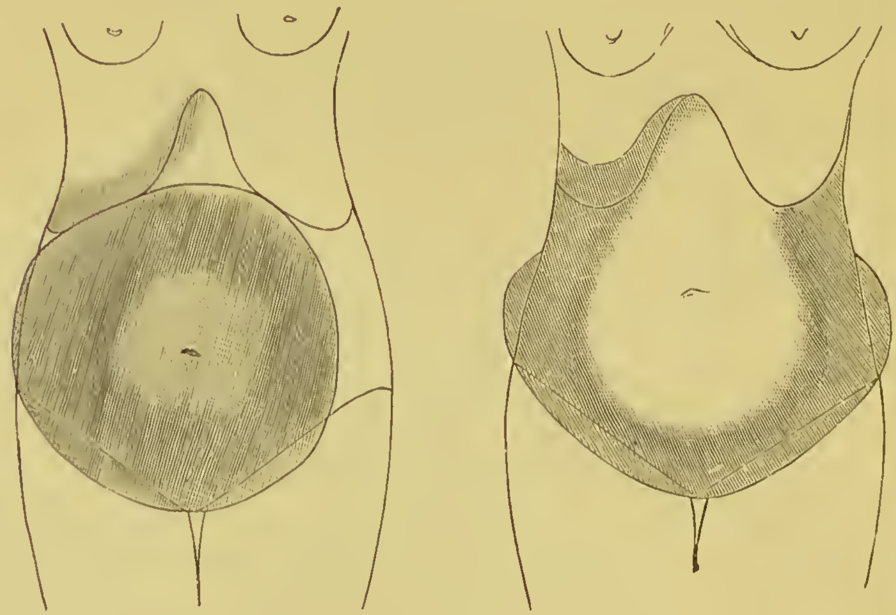

FIG. 126.

The shaded portion shows the dull area : left figure, ovarian tumour ; right figure, ascites (*Barnes*).

On *palpation*, the distension is felt to be due to an encysted collection of fluid. A mass is felt in the abdominal cavity which is like a sac filled with fluid. Fluctuation is got by placing one hand at a special part and tapping at an opposite point with the fingers of the other hand. However long the tumour be manipulated, *there is never felt any muscular contraction of the cyst wall.*

The feeling of fluctuation is, however, deceptive, and may be felt, for instance, in soft fibroid tumours of the uterus and solid colloid growths.

On *percussion*, when the patient lies dorsal, a dull note is obtained over the tumour (fig. 126) ; but at the flank where the tumour does not bulge, it is clear and tympanitic, since the intestines are there.

When the patient turns on her side with the flank uppermost, the dulness and tympanitic note do not change in position. This sign shows we have to deal with an *encysted* collection of fluid.

Auscultation gives entirely negative results. No sound is heard unless that of friction over a localised peritonitis.

On *vaginal examination*, the uterus may be felt displaced to one or other side, or very much to the front. It is rarely retroverted, and—unless impregnated—is not enlarged. The tumour does not usually bulge down into the fornices, so as to be accessible on vaginal examination.

In order to ascertain how the pedicle lies, we may make the examination *per rectum*, but as a rule it is quite unnecessary to ascertain this fact prior to operation. The tumour is drawn upwards in the abdominal cavity by an assistant. We now lay hold of the cervix with a volsella, pass the index finger of the right hand into the rectum, make traction on the cervix till the fundus is brought within reach of the rectal finger. We recognise a tense band passing from one angle of the fundus, and the enlarged ovarian artery may be felt pulsating in it. The possibility of both ovaries being cystic (which would produce a pedicle on each side), should not be forgotten, though this is comparatively rare. The examination with the volsella is made easier by placing the patient *in the genupectoral posture;* the weight of the tumour makes it gravitate into the abdomen, and renders the pedicle tense; it is also easier to make the rectal examination in this position.

3. *Differential Diagnosis.*

Differential Diagnosis.

They must be diagnosed from the following conditions:—

(1.) Pregnancy and Hydramnios,
(2.) Fibromyoma uteri,
(3.) Ascitic fluid,
(4.) Fibrocystic tumours of the uterus,
(5.) Parovarian tumours,
(6.) Encysted dropsy,
(7.) Thickened omentum enclosing intestines by adhesions,
(8.) Omental tumours,
(9.) Renal tumours,
(10.) Hydatid of liver,
(11.) Pseudocyesis,
(12.) Distended bladder.

In examining a case of abdominal tumour, the practitioner first makes his examination systematically—in every case what is called the routine examination, noting what he observes. By this means he may get facts enough to warrant his drawing a positive conclusion as to its nature. This, however, is not always the case, and he has then to use diagnosis *by exclusion:* it must be one of a certain fixed number of things, and the possibilities are excluded one by one till a definite diagnosis is reached. When examination is unsatisfactory, it should be repeated under chloroform.

We have stated above that ovarian tumours require to be diagnosed from twelve conditions. On each of these we make some brief remarks.

(1.) *Pregnancy.*—At the period of pregnancy when the uterus is so enlarged as to be above the pelvic brim, certain conditions are present. Those are suppression of menstruation for a given period, and size of the uterus corresponding to this; mammary signs; lineæ albicantes, and pigmentation. On palpation, we feel a tumour without distinct fluctuation and *having intermittent contractions;* the fœtus can be palpated out. The fœtal heart (after the fourth month) and the uterine souffle are heard. The vagina is dark in colour, the mucous secretion increased, and the cervix soft.

We need hardly say that palpation, the fœtal heart sounds, bruit and vaginal changes mark out the pregnancy unmistakably. These points may seem too simple to require mention, but cases have been recorded where the pregnant uterus has been tapped for an ovarian cyst.

Hydramnios may simulate an ovarian cyst. The amenorrhœa will help in diagnosis, and especially the occurrence of intermittent contractions as Braxton Hicks has specially pointed out. In one of his recorded cases, the tumour was the size of a seven months' uterus with distinct fluctuation, and there was amenorrhœa for five months. Palpation gave the uterine hardening. Previous to this it had been tapped as a cystic ovarian tumour. The uterus in hydramnios may be very large, filling up the abdomen, and the practitioner may thus easily be thrown off his guard. In an ovarian tumour of that size, however, growth would not be so rapid, and the uterus would be felt separate. A very valuable sign in hydramnios is ballottement. The fœtus can be made to "bob" up and down by the vaginal finger.

(2.) *Fibromyoma uteri* (*v.* Section V.).

(3.) *Ascitic fluid.*—When the patient lies on the back, percussion gives a tympanitic note at the umbilicus and a dull one at the flanks (fig. 126); when on the left side, the note is dull on that side and clear over the right; when on the right, it is dull on that side and tympanitic on the left; when she sits up, the upper limit of the dulness is curved with the convexity downwards.

The reason of this is evident. The intestines float on the fluid at its highest point, and give the tympanitic note accordingly (fig. 126).

In tuberculous and malignant peritonitis the change of note as the patient alters her position is less perfect, owing to adhesions limiting the movement of the peritoneal fluid. This is a help in diagnosing such conditions.

(4.) *Fibrocystic tumours of the uterus* are difficult to diagnose. The following points should be noted. Fluctuation is only partial and the consistence is variable; the rate of growth is slower; and the fluid drawn off coagulates spontaneously (*Atlee*). It is often difficult to distinguish these from ovarian tumours, and the best operators have sometimes failed to do so (*v.* Section V.).

(5.) *Parovarian tumours* have very well-marked fluctuation, have their characteristic fluid, and when once tapped do not usually refill as they are often retention cysts.

(6), (7), and (8.) In many cases we can make out that the tumour does not pass down into the pelvis and is not connected with the uterus. Sometimes the case is obscure, and abdominal incision alone clears matters up.

(9.) *Renal tumours* grow downwards and inwards, have all their edges rounded, and do not as a rule project posteriorly. On percussion there is a tympanitic note over them, due to the colon being in front. When right-sided, the colon gives also a tympanitic note between them and the liver. Their fluid contains urea.

(10.) The *hydatid* may be connected with the liver and contains hooklets.

(11). In *Pseudocyesis*, the percussion note is tympanitic and the swelling disappears under chloroform.

(12.) The *distended bladder* is of course emptied by the catheter.

C. WHEN LARGE AND EXTRAPERITONEAL (OFTEN PAPILLOMATOUS).

In this class the tumour is not pedunculated, and in its extraperitoneal burrowing growth pushes aside uterus, bladder, or large intestines, so that extreme displacement of these may take place (*v.* fig. 7, Pl. VII.). It is therefore of importance in the diagnosis of large abdominal cysts to ascertain the position of the uterus, and also the percussion note so as to make out if large intestine is displaced. When these tumours develop laterally, the displacement of the uterus is an aid to diagnosis; when posterior to the uterus, however, their diagnosis is less easy, as they may only slightly displace the uterus. They usually then bulge well down into the pelvis, lying below the peritoneal level. These cases are very puzzling, however, and may only be made out on operation.

Their existence should be suspected

(1.) If uterus or bladder is displaced markedly;

(2.) When over a cyst of size sufficient to displace the small intestine, we get a tympanitic note. This indicates displacement of large intestine, which can only be done by an extraperitoneal cyst.

DIAGNOSIS OF ADHESIONS.

Diagnosis of Adhesions.

When pelvic, the fixation of the tumour they cause can be felt. Adhesions are often the result of tapping or torsion of the pedicle; they may also arise from mere pressure. Careful inquiry should always be made as to the history of inflammatory attacks. On palpating the tumour, one can often feel friction. On making the patient take a deep breath, it should be noted whether the abdominal walls move over the surface of the tumour. Much less importance is attached nowadays to the existence of abdominal adhesions. When pelvic, especially if to the bladder or deep in the pouch of Douglas, they are more serious.

CO-EXISTENCE OF PREGNANCY AND OVARIAN TUMOUR.

Co-existence of Pregnancy.

It should be kept in mind that pregnancy may co-exist with an ovarian tumour, giving its own special symptoms and physical signs in addition.

TORSION OF THE PEDICLE.

There is a history of sudden attacks of pain, often very severe: elevation of pulse and temperature, and peritonitis. The attack may pass off and recur (*v.* p. 268).

CHAPTER XXIV.

OPERATIVE TREATMENT OF OVARIAN TUMOURS.

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Treatment of Ovarian Tumours.

REMOVAL of the ovarian tumour, or Ovariotomy, is the treatment now practised. Other methods, have, however, been employed ; a brief *resumé* of these will be interesting to the student.

Exploded Methods.

These methods have been tapping, tapping and injection of the cyst with iodine, electrolysis, drainage into the peritoneal cavity or through the vagina.

Tapping is not a method of treatment followed by cure, and should be used only when it is absolutely necessary to obtain fluid for diagnosis. It may cure parovarian cysts, but it is best to remove them by abdominal section. Ovarian cysts are not retention cysts but have a proliferating lining membrane, for which reason tapping does not cure them. An additional reason against tapping is that it is a procedure by no means free from danger, even to life. By oozing of the fluid through the puncture, adhesions are set up: in some cases septic peritonitis has proved fatal. Tapping, further, is only palliative and must be followed by ovariotomy.

Method of Tapping.—See that the bladder is empty. With the patient lying on her back make an incision through skin and fat for about an inch, and midway between umbilicus and pubes. Then plunge in the trocar seen at fig. 128. To the side-tube a long piece of tubing is attached, which dips under water. While the fluid is flowing, the patient lies on her side. No bandage is necessary. Care should be taken to prevent regurgitation of air, and a suitable dressing should be applied to the wound (*vide* under Ovariotomy).

Tapping and injection of the cyst with iodine is a procedure not now practised, owing to the risks and uncertainty attending it.

Electrolysis was at one time advocated as a means of cure. Its pretensions to this are unfounded, and it is not now practised. Its use has been carefully considered by Mundé of New York, and Semeleder, city of Mexico, in the articles cited, which may be consulted for details and information.

Drainage into the peritoneal cavity, or through the vagina.—The former is dangerous and the latter is practised only where the cyst is immovably fixed by adhesions.

One fact must be finally noted. Cases of cure of ovarian cysts by tapping, drainage, or electrolysis, are sometimes recorded. These cysts have probably not been ovarian but cysts of the broad ligament—parovarian. Mere tapping often cures the latter. Electrolysis does the same. Electricity has nothing to do with it, the puncture of the needle is enough, as in this way the fluid escapes, and if aseptic is absorbed and excreted by the kidneys.

OVARIOTOMY.

This may be performed either by vaginal or abdominal incision.

VAGINAL METHOD.

Vaginal Ovariotomy.

Small ovarian tumours were removed by vaginal incision (posterior colpotomy) by the early gynecologists (Thomas, Goodell, and others), but after a time this method was abandoned. Recently it has been revived by Dührssen, Schauta, Abel, and others, and even large tumours are removed either by posterior or anterior colpotomy, usually the latter. Results have been good, but it is evidently best suited for simple cases. Extraperitoneal cysts are quite unsuitable for it (*v.* Chap. on Abdominal Section in Appendix).

ABDOMINAL METHOD.

Abdominal Ovariotomy.

The question used to be discussed as to the best time to operate in a case of ovarian tumour—whether, if small, one should wait until it is large. The opinion now held is that one should operate whenever the tumour is diagnosed without reference to its size.

Let us suppose, then, that the ovariotomist has a patient—who is otherwise healthy—with an ovarian tumour, and that her period has occurred ten days before. How is the operation performed?

For precautions to ensure asepsis see Chap. XV. on Antisepsis and Asepsis.

If the patient has not been in any way confined to bed, it is probably better to delay the operation for a few days. A pulse and temperature chart should also be kept for a few days prior to the operation. She is put on light diet, and has no solid food for six hours previous to the administration of chloroform. For at least two days prior to operation, measures should be adopted to secure a thorough evacuation of the bowels, and on the morning of operation an enema is administered.

Requisites for Operations.

The following are the requisites for operation:

Chloroform and ether;
Hypodermic syringe, with ether and strychnine;
Antiseptic lotions;
Porcelain trays for instruments;
Swabs (a definite number), both large and small;
Knives;
Probe-pointed bistoury;
Scissors, straight and curved;
Retractors;
Dissecting and dressing forceps;
Artery forceps—a definite number (12) of pairs;
Larger forceps (6 pairs)—to be used as clamps;
Pedicle needle (fig. 131);
Catgut and silk—various sizes;
Silk-worm gut and horse hair;
Two pairs ovariotomy forceps (Nélaton's or Keith's);
Well's trocar and tubing;
Aspirator (in reserve);
Clamp (in reserve);
Curved needles and needle-holder;
Drainage tubes (glass or ordinary);
Iodoform, iodoform gauze, sterilised wool, flannel bandages.

Assistants

The assistants necessary are three in number, viz., one for anæsthesia, one for instruments, one to help the operator. A trained nurse who can pass the catheter and administer purgative or nutritive enemata, is necessary. The sponges or swabs should be looked after by a nurse who realises the importance of the "count," and for manipulating the table when necessary, another nurse is requisite. The patient is placed on a Trendelenburg table, of convenient height and length, and lies on her back. The table is placed so that the patient's head is towards the window. The legs and chest are to be warmly covered, and hot-water bottles, carefully protected, should be laid at her sides and feet if the table has not a hot water compartment. The temperature of the room should be from 65° to 70°. The instruments are placed near the operator in shallow porcelain trays, and in 1–80 carbolic solution or boiled water.

Sponges and Swabs.

Sponges should be soft, fine, and thoroughly clean. Twelve are sufficient. Some are small and on sponge holders; one is large and flat. They should be thoroughly wrung out of warm 1–60 solution. *The sponge assistant should know how many sponges he has, and should be sure that he has recovered them all before the abdominal wound is closed. Sponges should never on any account be torn up during an operation.*

Swabs are now generally employed (*v.* Chap. XV.) and their number must be accurately known and checked after operation.

Preliminaries.

Preliminaries.—The patient, who has had a very light breakfast some hours previously, should be chloroformed or etherised; the skin has been cleansed and shaved previously, but most operators in addition wash it with soap and carbolic lotion, or use methylated spirit and corrosive lotion before beginning the operation. The boundaries of the exposed abdomen are covered with thin mackintosh, and over this is placed a sterilised sheet with a slit corresponding to the field of operation.

The following are the steps of an ordinary operation:—

1. The abdominal incision;
2. Evacuation of the cyst contents;
3. Drawing out of the cyst from the abdomen;
4. Securing the pedicle;
5. Treatment of adhesions, and of bleeding from them;
6. The peritoneal toilette;
7. Closure of the abdominal wound;
8. Drainage—when necessary;
9. Dressing of the wound;
10. After-treatment.

Incision.

1. *The abdominal incision.*—This is usually four inches long, is made in the middle line, and has its lower limit about an inch above the symphysis. For details as to this see the chapter on Abdominal Section.

All bleeding points are carefully attended to before the peritoneum is opened. They may be seized with forceps which are left on for a time, or they may be ligatured with catgut. When the extraperitoneal fat is reached, it is picked up with two forceps so as to get a short transverse fold; this is cut, and the manœuvre repeated until the peritoneal cavity is opened. The cyst is then exposed.[1]

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[1] Sometimes the cyst develops between the layers of the broad ligament, lifts up the anterior lamina, and strips the peritoneum off the anterior abdominal wall. When the operator has cut through the abdominal muscles he is puzzled by finding no peritoneum. Puncture and dragging out the collapsed cyst will, however, clear up matters.

Methods of Evacuation.

2. *Evacuation of the cyst contents.*—This may be accomplished in various ways. Well's trocar (fig. 127), with its point projected, is plunged in, and the fluid passes along the thick tube to a suitable pail below the table. As soon as the trocar enters the cyst, the shield is pushed out to guard the point. The trocar has teeth for catching up the cyst wall. Keith used a large aspirator, so as to empty speedily. Schroeder used no trocar, but simply cut in with his knife and squeezed the fluid out. The kneed trocar may be used (fig. 128). A simple large trocar without toothed catch is best. When the fluid is very thick it may not flow, and have to be squeezed or scooped out. Secondary cysts, if large, are also perforated with the trocar or the finger passed in.

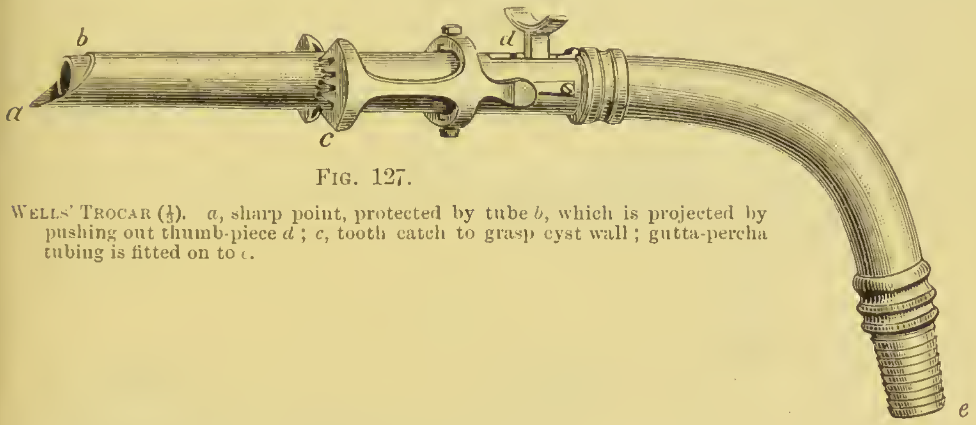

FIG. 127.

WELLS' TROCAR (½). *a*, sharp point, protected by tube *b*, which is projected by pushing out thumb-piece *d*; *c*, tooth catch to grasp cyst wall; gutta-percha tubing is fitted on to *e*.

While the fluid is being evacuated an assistant keeps up gentle pressure on the abdominal walls, in the region of the flanks, in order to prevent fluid from passing in or the intestines from passing out.

If, on tapping, pus escapes (*see* Suppurating Tumours, p. 269), the puncture should be at once clamped with forceps, and the tumour removed en bloc. When pus is suspected it is better not to tap.

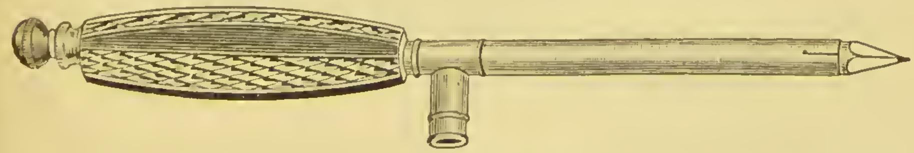

FIG. 128.

TROCAR FOR TAPPING. Tubing is fitted to side-piece.

Cyst drawn out.

3. *Drawing out of the cyst from the abdomen.*—This is accomplished by seizing the collapsed walls of the tumour with Nélaton's (fig. 129) or Keith's forceps, and steadily pulling it out. The assistant still keeps up pressure. By this means the operator now has the pedicle at the

Cyst separated. abdominal incision, and the cyst outside. The assistant by means of swabs keeps back the intestines should they tend to protrude.

Securing of Pedicle. 4. *Securing of the pedicle.*—This is one of the most important steps of the operation. There are three methods which may be used, viz.—

The clamp,
The cautery,
The ligature.

Of these, the clamp is not now used. Keith and others advocated the cautery; but the ligature and dropping back of the pedicle is the favourite and best method.

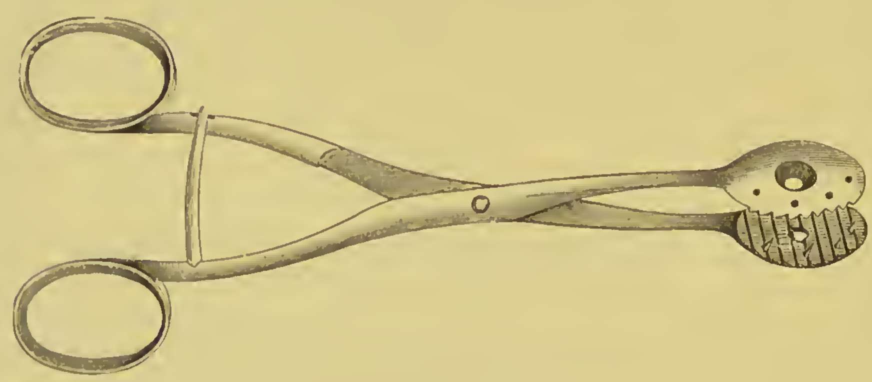

FIG. 129.

NÉLATON'S FORCEPS.

By Clamp. *The clamp* was introduced by Jonathan Hutchinson, but, as already said, has yielded to the ligature. The varieties of clamp are numerous. Fig. 130 shows Wells'; it consists of two short arms jointed together and provided with a screw and removable handles. It is used as follows:—

The clamp is held by its handles and made to grasp the pedicle between the cyst and the uterus; the bars of the clamp proper are then approximated, and the screw tightly screwed up. The pedicle is examined to see that it is grasped and equally compressed; if one part is thin, Spencer Wells recommended that the pedicle be first secured with a ligature. The pedicle is treated extra-peritoneally with the clamp, which rests on the skin. The great advantage of the clamp is its security against hæmorrhage. Its evident disadvantages are the following: It does not suit all cases, as it cannot be used when the pedicle is too large or too short; it may cause ventral hernia; it exercises undue traction on the uterus; but, above all, it may cause a slough deeper down than the skin, and the discharges, passing into the peritoneal cavity, may do great mischief. Thus the mortality was high (25 p.c.) in cases where the clamp was used.

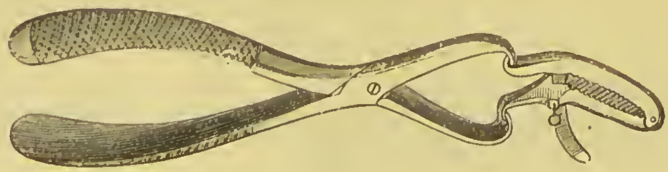

FIG. 130.

WELLS' CLAMP (½), with removable handles. The serrated part with the screw is the clamp proper.

By Cautery.

The cautery was introduced, as a means of treating the pedicle, by Baker Brown of London.

In order to use the cautery, we need a special cautery clamp and either cautery irons or Paquelin's cautery. Keith used ordinary cautery irons heated in a little charcoal brazier. The *cautery-clamp* has two hinged bars provided with handles; each bar has one surface, which is made of ivory—a non-conductor—and is placed next the skin; the other surface is made of metal; one of the bars has on its metal surface a metal upright running the whole length of the bar. The pedicle is seized with the clamp (ivory side next to the skin), and the screw turned to fix it. Then the cyst is cut off, so as to leave about an inch of the pedicle on the metal side. The cautery iron (which is hatchet-shaped) at white heat, is then passed firmly over the surface, in the angle between the horizontal bar and the upright, until the pedicle is seared flush with the clamp. It acts by heating the clamp to a dull heat and cornifying the part grasped. The pedicle is now caught at the under surface of the clamp with two pairs of forceps, and the clamp removed. If all is right, the pedicle is dropped into the abdomen after the peritoneal toilette is finished.

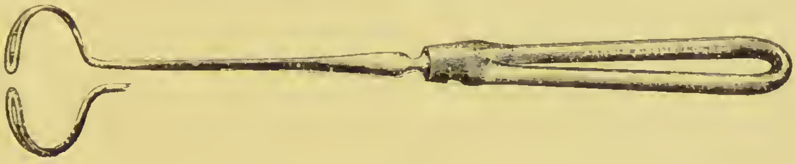

FIG. 131.

PEDICLE NEEDLE.

By Ligature.

The ligature should be thin sterilised Chinese silk No. 3 or 4, or catgut. It is used in the following way:—

A double silk ligature is threaded on a *blunt* pedicle needle (fig. 131). The pedicle is transfixed with this, and the ligature cut. Thus we have two ligatures through the pedicle; one is passed round the one half of the pedicle, the other round the other half. They interlace first so as to make a figure of eight (fig. 132, 1). Each is tied firmly in a reef knot. The pedicle is then seized with forceps, one on each side above the ligature; the cyst is clipped off about half an inch on the cyst side of the ligature; while the pedicle is still held up by the forceps it can be carefully examined to see if any bleeding occurs. It should be noted whether the ligature splits the pedicle vertically so as to cause bleeding; if so, the ends of the thread can be made to surround the

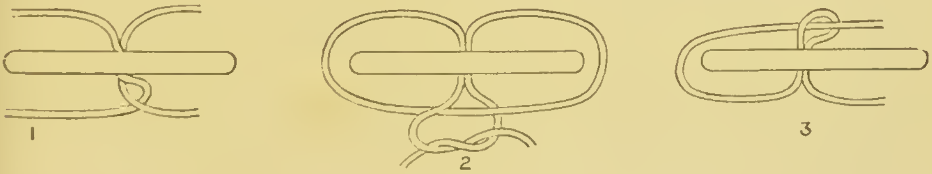

FIG. 132.

LIGATURE OF PEDICLE by (1) interlocking double pedicle; (2) Tait's knot; (3) Bantock's knot. These must be completed by artery knot.

whole pedicle below this. If there is no bleeding, the peritoneal edges may be united over the raw surface with a running catgut suture, the ligature cut short, and the pedicle dropped into the pelvis.

When the pedicle is thick and fleshy it may require to be tied in three portions as follows: Pass a double thread so that its shorter half will embrace only *one-third* of the pedicle; withdraw the needle, but keep it still running on the thread, and use it to carry the longer half of the thread through a second point so as to embrace the *middle third* of the pedicle; one portion of the longer half thus forms a loop round the middle third, while the other portion embraces the *other third* of the pedicle. Tait's or Bantock's knot may also be used (*v.* fig. 132).

Instead of using the mass ligature, some operators prefer to tie the infundibulo-pelvic ligament so as to secure the ovarian artery in its outer part, then secure it on its uterine side, and also ligature (with catgut) the ovarian ligament. The tumour is then cut off, any bleeding point secured, and the peritoneal cut edges brought together with fine catgut.

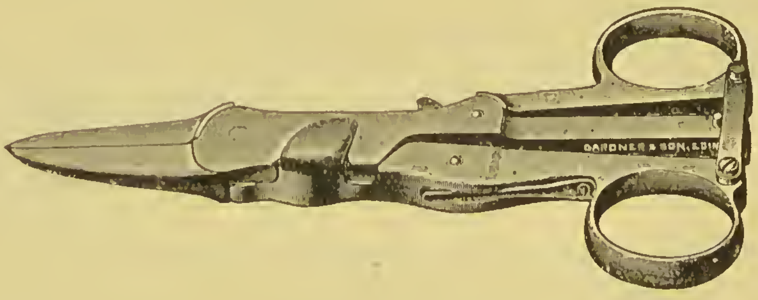

Fig. 133.
Doyen's Angiotribe.

Instead of tying the pedicle with a ligature it may be crushed with the angiotribe (fig. 133). This instrument was introduced by Doyen, and consists of a powerful compressor which crushes the tissues so as to obliterate the blood-vessels. Its use alone as a means for securing the pedicle has, however, not been found safe in all cases. A thin silk ligature should therefore be thrown round the crushed tissue for greater security against hæmorrhage.

After the pedicle has been secured by one of these methods, the other ovary should be examined, and, if cystic, removed also.

Treatment of Adhesions and Bleeding.

5. *Treatment of adhesions and bleeding.*—Adhesions in certain cases may give a great deal of trouble. They may be at any point of the periphery of the tumour. When close to important viscera (especially the bladder, intestine, or liver), they are serious. Their treatment is best considered as follows:— (*a.*) when short (*b.*) when long.

(*a.*) When easily separable, they may be detached by sponging. If the cyst is connected with the anterior abdominal wall, it is sometimes cut into. The operator then separates the cyst from the wall by passing his finger in between them where the adhesion ceases; or he may evert the abdominal wall, and strip the cyst off it with dissecting forceps. Spencer Wells recommended in bad cases to evacuate the cyst, and then, by seizing the posterior wall of the cyst with a hand passed into the interior, to evert it and afterwards separate the adhesions. Pressure with sponges or ligatures will arrest any bleeding. If the bleeding is intractable, a good plan is to pinch up the abdominal walls at the bleeding part and pass a long straight needle through this fold, so as to keep the bleeding peritoneal surfaces in apposition.

Adhesions in the region of the sacro-iliac synchondrosis are dangerous owing to the risk of tearing into the large veins or ureter. The possibility of an adhesion to the tip of the vermiform appendix must be kept in mind.

(*b.*) When the adhesions are *long*, they may be ligatured at two points close to the cyst, and divided between these.

When adhesions to the bladder are present great care must be taken, as, in separating them, the bladder may be torn into. If this happens, the tear should be stitched with fine silk or catgut, and a catheter kept in for some days. (*Vide* under Vesico-vaginal Fistula). When adhesions are inseparable, the adherent portion of the cyst may be ligatured all round with silk, and then cut beyond the ligatures; or it may be simply cut all round the adherent portion, and the edges then cauterised. By placing the patient in the Trendelenburg posture bleeding points in the pelvis can be readily seen and secured.

Peritoneal Toilette.

6. *The peritoneal toilette.*—This term is a convenient one used by German operators to indicate the *cleansing of the peritoneum.* It must be laid down as a cardinal principle in abdominal section that no serum or blood is to be left in the abdomen. The peritoneum should be thoroughly dry, and no oozing points are to be left The importance of the toilette cannot be too strongly insisted on. Thomas Keith, whose success in ovariotomy was unrivalled, took the greatest care in this matter, and attributed his success to it.

Closure of Wound.

7. *Closure of the abdominal wound.*—This is done as described under Abdominal Section in the Appendix. Prior to its closure, however, the operator should see that the "count" of swabs or sponges, and of instruments is correct. A large number of cases has now been recorded where one or other of these has been left in the abdomen, with serious, or even fatal results.

Dressing.

9. *Dressing of the wound.*—Where there is no drainage, it is sufficient to lay on a pad of sterilised gauze or other antiseptic material. The gauze is fastened down with adhesive antiseptic strapping, and

above all is placed cotton wool and a broad flannel bandage. If the pulse and temperature do not rise and there is no uneasiness, the dressing is left untouched—in simple cases—for eight or nine days. If there is drainage, the dressing should be changed occasionally, according to the amount of discharge (*v.* chap. on Abdominal Section).

After-treatment and Complications.

10. *After treatment.*—Morphia may be given hypodermically, but only when necessary (*vide* p. 173). Little food is allowed for the first thirty-six hours; hot water should be given occasionally, as it helps flatus. At the end of this time milk and beef-tea are added. An enema may be administered on the third or fourth day. When flatus is troublesome, a tube may be passed into the rectum or an enema given. A useful enema for this purpose is 1 oz. of glycerine, 1 of Henry's solution, and 2 of water. It can be received into cotton wool pads. Calomel in quarter grain doses every half hour until four grains are given is also good. Sickness is often great, and should be treated with mustard poultices over the epigastrium and enemata of beef-tea and brandy. If it persists unduly, two or three grains of calomel may be given. Tait recommends thirty or forty grains of Epsom salts each hour until the bowels move.

The great guide as to the patient's safety is the state of the pulse. A slow pulse, absence of abdominal distension, and the passage of flatus downwards are the three cardinal symptoms of a safe recovery.

The various disturbances which may interfere with convalescence will be considered in the chapter on Abdominal Section.

ABDOMINAL METHOD WHEN THE TUMOUR IS EXTRAPERITONEAL.

In such cases (*v.* fig. 7, Plate VII.), a different procedure has to be adopted, viz. Enucleation. The tumour is tapped, drawn on as much as possible, and its peritoneal covering incised, so as to include an elliptical portion. It is of value to tie off the ovarian and uterine arteries on the side on which the tumour lies as this helps greatly to limit hæmorrhage. The finger is then used to separate the tumour from its capsule, steady traction facilitating this. Bleeding is arrested with forceps or ligature. Goodell, who has given by far the most graphic description of this method, advises that the uterus and bladder be carefully defined, and the separation begun at the uterine side of the tumour where the large blood vessels enter. The difficulty in the operation is the separation in the pelvis, since the large veins there (as well as the ureter) are apt to be torn. Injury to or ligature of the ureter is especially dangerous: it is often not recognised, but if noticed it must be specially treated (*v.* chap. on Abdominal Section).

When enucleation is finished, a large oozing extraperitoneal surface is left. Its edges should be stitched to the abdominal incision, so as to close it off from the peritoneal cavity, and iodoform gauze passed in.

Some, however, close this opening and drain *per vaginam* using the iodoform tampon. An india rubber drainage tube may be substituted in four to five days.

Cases like these are the really difficult and dangerous ones. The chance of recurrence or peritoneal infection is very great.

The idea of this method of enucleation is due to Miner of Buffalo, although the pathology of this form was not clearly understood then: indeed Miner's original paper, inasmuch as it seems to apply to the ordinary ovarian cyst when adherent, was not very intelligible.

OVARIOTOMY WHEN PREGNANCY IS PRESENT.

Pregnancy and Ovariotomy.

Although pregnancy co-exists with a large ovarian tumour, ovariotomy should be performed. Bland Sutton gives interesting tables of unilateral ovariotomy during the earlier and later months of pregnancy, of double ovariotomy, and of ovariotomy in the puerperium. These show that before the fourth month the mortality is low, and the risk of abortion small, being greater for parovarian than ovarian tumours. After the fourth month the risk is as in ordinary ovariotomy, but the chance of abortion increases progressively with the advance of pregnancy. Puncture of the gravid uterus during the progress of the operation must be guarded against. This may happen if the pregnancy has not been diagnosed and the pregnant uterus mistaken for a secondary cyst: or it may be as in Lee's case that, owing to a change of the position of the patient from the dorsal to the lateral posture, the ovarian cyst recedes from the abdominal incision and the uterus lies below it without the change being noted. When this accident occurs, the treatment depends on the depth of the uterine wound. Should the uterine cavity not be opened, then bleeding is arrested by pressure and the wound stitched with continuous silk suture. If the amniotic cavity is opened into, the same treatment may be adopted (*v.* Chiara's case); or the incision may be suitably enlarged, and the fœtus, placenta, and membranes extracted. The treatment after this may be removal of the uterus (*see* Hysterectomy), or the uterine incision may be closed with catgut or silk stitches as in ordinary Cæsarean Section. The question of the treatment of a labour complicated with an ovarian tumour concerns the obstetrician rather than the gynæcologist.

CONTRA-INDICATIONS TO OVARIOTOMY.

Contra-indications.

Malignant disease[1] while not an absolute contra-indication, in most cases makes operation inadvisable. Ordinary ascites, kidney disease, or heart disease, is not a contra-indication unless far advanced. Prognosis should be guarded in these cases. In some fatal cases it has been found on post-mortem that the kidneys were small and granular from interstitial inflammation. This may be present while there is no albumen in the urine. There is usually a pulse of high tension and cardiac hypertrophy.

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[1] Of 372 cases operated on, 28 per cent. died as the result of the operative interference, chiefly owing to the dangerous adhesions. Of those who recovered, 59 per cent. had a recurrence of the disease, usually within a year's time. In only 3·2 per cent. of cases of carcinoma, and 12 per cent. of sarcoma was there a prolonged survival. (Estor and Puccle's statistics of published cases. *Revue de Gynécolog. et Chir. Abdom.*, Dec. 1900).

COURSE AND RESULTS OF OVARIAN TUMOURS WHEN LEFT ALONE.

Natural History of Ovarian Cysts.

Under this head we have to consider complications which may arise in the tumour if not operated on.

In some rare cases the operator is unable to remove the cyst after he has begun his operation. He may then stitch the cyst edges to the abdominal walls carefully closing it off from the peritoneum. The best results by this method are got in dermoid and parovarian cysts: they are not good in ordinary ovarian cystomata.

Adhesions may be set up as the result of chronic peritonitis arising from pressure or tapping.

Rupture of the Cyst.

Rupture of the cyst sometimes occurs with varying symptoms. Should the opening be small and the escape of the contents gradual, the occurrence may pass unnoticed.[1] Or there may be the usual symptoms of an acute abdominal lesion, and even death in the absence of operation. Pseudomyxoma peritonei may result, when the contents have been gelatinous (p. 240). The colloid material though tolerated by the peritoneum, is not absorbed, and should the rent remain open a large quantity may accumulate. It sometimes has a malignant character and may invade the liver substance.[2] It has been shown by experiments on rabbits that ovarian fluid not only acts as an irritant on the peritoneum, but in its excretion affects the liver and kidneys, causing cloudy swelling and necrosis of the cells (Arché and Chavannez: *Archiv de Méd. Experiment*, 1903, No. 3). Waxy disease of the liver kidneys, etc., may result in those cases where the tumour suppurates and discharges into the bowel or through the skin. When parovarian tumours burst, the fluid is usually non-irritating, and is absorbed by the peritoneum, the patient thus sometimes becoming cured.

Torsion of the Pedicle.

Torsion of the pedicle to a slight extent is often noticed in ovarian tumours.[3] When the torsion is so great as to cut off the blood supply from the cyst, we get gangrene of the tumour, and in some cases very serious symptoms, viz., vomiting, severe abdominal pain, and peritonitis. Wiltshire of London and Tait were the first to operate for this condition.

The twist is to the middle line, and is believed by some to be due to a law of spiral growth. It is also found to occur in the spermatic cord. Another explanation is that it is due to the respiratory movements and retardation of part of the tumour, as it ascends and descends, by the pedicle and less mobile portion of the abdominal wall with which it is in contact.

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[1] Haultain—Intra-Peritoneal Rupture of Simple Ovarian Cysts: Edin. Obstet. Trans., 1900-01, p. 55.

[2] Polano: "Monats. f. Geb. u. Gyn.," Bd. XIII., Hft. 6.

[3] Spencer has noted it in two cases of parovarian tumour where it produced no change in the cyst though the ovary was congested, "Lond. Obst. Trans.," 1900, p. 333.

According to H. W. Freund, the pedicle twists to the right in right-sided tumours ; to the left in left-sided ones, and a large proportion of the tumours undergoing this twist are dermoids ($25^{\circ}/_{\circ}$).

If peritonitis occur before the tumour is removed, ovariotomy should be at once performed. Keith was the first to do this successfully.

Suppuration in the Cyst.

Suppuration is most likely to occur in a cyst, complicating pregnancy and labour. Adhesion of the cyst to the intestine or vermiform appendix accounts in some cases for infection. Besides the ordinary pyogenic organisms the bacillus coli communis and the typhoid bacillus have been found—the latter in cases of typhoid fever.[1]

Course when left alone.

The course and results of ovarian tumours when left alone can fortunately not now be studied. The picture of ovarian disease running its course unchecked, so eloquently described by West, is happily now almost unknown.

"We have symptoms of the same kind as we see towards the close of every lingering disease, betokening the gradual failure, first of one power, then of another; the flickering of the taper, which, as all can see, must soon go out. The appetite becomes more and more capricious, and at last no ingenuity of culinary skill can tempt it, while digestion fails even more rapidly, and the wasting body tells but too plainly how the little food nourishes still less and less. The pulse grows feebler, and the strength diminishes every day, and one by one each customary exertion is abandoned. At first the efforts made for the sake of the change which the sick so crave for are given up ; then those for cleanliness; and lastly, those for comfort—till at length one position is maintained all day long in spite of the cracking of the tender skin, it sufficing for the patient that respiration can go on quietly, and she can suffer undisturbed. Weariness drives away sleep, or sleep brings no refreshing. The mind alone, amid the general decay, remains undisturbed ; but it is not cheered by those illusory hopes which gild, though with a false brightness, the decline of the consumptive; for step by step death is felt to be advancing; the patient watches his approach as keenly as we, often with acuter perception of his nearness. We come to the sick chamber day by day to be idle spectators of a sad ceremony, and leave it humbled by the consciousness of the narrow limits which circumscribe the resources of our art." (Quoted by Spencer Wells.)

The question of the mortality after ovariotomy is a complex one, owing to differences in cases and also because the use of the clamp in early operations unduly raised the death rate. Of late years the mortality has fallen considerably, chiefly owing to the use of the intraperitoneal treatment of the pedicle by the ligature, and the great care now exercised to avoid sepsis.

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[1] Lovrich: "Centralbl. f. Gyn.," 1898, No. 23.

SECTION V.

AFFECTIONS OF THE UTERUS.

THERE are three periods during which morbid conditions of the uterus arise.

1. *The period of evolution or development*—from the ovum up to puberty. During this stage they appear as anomalies in development —before birth or during childhood. They produce no marked symptoms, but a recognition of their existence is important as regards the future history of the patient.

2. *The period of physiological activity*—from puberty to the menopause. During this stage there occur in the uterus the morbid processes of acute and chronic inflammation, and of new formation or tumour-growth; on account of its mobility, the uterus is also liable to various forms of displacement. These pathological processes give rise to symptoms of themselves, and also from their effect on the normal functions of the uterus—menstruation, conception, and pregnancy. During parturition the cervix uteri is frequently lacerated, and this may be the starting-point of important pathological conditions.

3. *The period of senile involution or retrogressive development*—from the menopause to death. The term involution is generally used in the restricted sense of the process which occurs after childbirth, but it is the only one which conveniently expresses the retrogressive changes after physiological activity has ceased. During this stage, the most important pathological process is that of malignant new-formation.

Accordingly, the following subjects have to be considered in this Section:—

Chapter XXV. Malformations of the Uterus.
,, XXVI. Atresia and Stenosis of the Cervix Uteri.
,, XXVII. Atrophy of the Cervix and Uterus: Superinvolution.
,, XXVIII. Hypertrophy of the Cervix; Amputation.

CHAPTER XXIX. Laceration of the Cervix and its Consequences.
,, XXX. Chronic Cervical Catarrh.
,, XXXI. Endometritis.
,, XXXII. Metritis, Acute and Chronic; Subinvolution.
,, XXXIII. Displacements of the Uterus: Anteflexion; Anteversion; Retroversion; Retroflexion.
,, XXXIV. Inversion of the Uterus.
,, XXXV. Tumours of the Uterus. Fibroid Tumour: Pathology and Etiology.
,, XXXVI. Fibroid Tumour of the Uterus: Symptoms and Diagnosis.
,, XXXVII. Fibroid Tumour of the Uterus: Treatment.
,, XXXVIII. Fibrocystic Tumour of the Uterus.
,, XXXIX. Uterine Polypi: Tuberculosis.
,, XL. Carcinoma Uteri (of Cervix): Pathology and Etiology.
,, XLI. Carcinoma Uteri (of Cervix): Symptoms and Diagnosis.
,, XLII. Carcinoma Uteri (of Cervix): Treatment.
,, XLIII. Carcinoma Uteri (of Body): Deciduoma Malignum.
,, XLIV. Sarcoma Uteri.

CHAPTER XXV.

MALFORMATIONS OF THE UTERUS.

LITERATURE.

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Relation of Malformations to Development.

WHAT is usually described as "malformation" is really a nonformation of one part, involving a relative disproportion. Of this we have an illustration in the uterus. The one-horned uterus is not a "malformation," if by this term we mean that the part which is present is maldeveloped; the condition is a result of the *non*formation of the other horn and intervening fundus. It is misleading also to speak of a "double uterus;" the structure thus described is really one uterus, in which the halves have not united into a whole. The word as used, therefore, means an incomplete *result*, not a defective process. *Mal*-development is a contradiction in terms, there can only be *arrested* development.

Malformations must be studied in connection with the normal development of the organ. In this way, they become at once intelligible. There are two processes in the progression of an organ to its mature form—*development* and *growth*. There are therefore two causes which together operate in producing malformations—arrested development and arrested growth. The period of development of the uterus, by which we mean formation of parts, extends up to the twentieth week; the period of growth is much longer, and extends to the twentieth year.

The student should not pass over this section of the subject as of little importance. To the practical man, malformations seem of little value because he has no power of modifying the result. To the scientific man they are, however, of the greatest interest as furnishing him with permanent impressions of the transitional states of development; they are development caught in the act and fixed permanently for after-investigation. In this chapter we recommend the student to read Etiology before Pathology.

PATHOLOGY.

Uterus absent or rudimentary.

Complete absence of the uterus is an extremely rare occurrence, and cannot be demonstrated except on post-mortem examination. It has been described only in cases of fœtal monstrosities. A *rudimentary condition* sometimes occurs; in this the uterus is represented by a band of muscular fibre and connective tissue on the posterior wall of the bladder (fig. 134), and the peritoneum forms a single pouch between the bladder and the rectum (fig. 135).

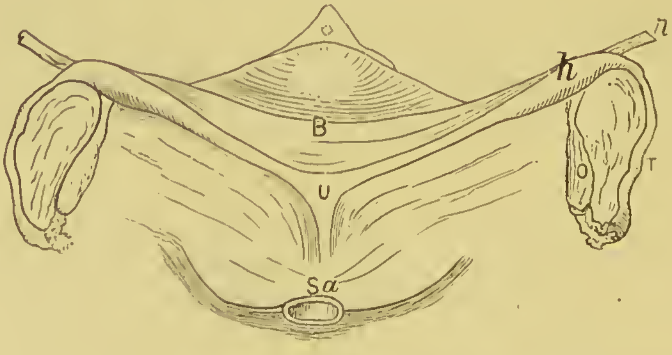

FIG. 134.

RUDIMENTARY UTERUS (*Veit*). *Sa* Sacrum; *U* Solid Rudiment of Uterus; *h* Rudimentary Horn; *B* Bladder; *O* Ovary; *T* Fallopian Tube; *r* Round Ligament.

In the *uterus bipartitus* (fig. 136), rudimentary horns are present and are solid or hollow. The cervix is represented by a fibrous band which connects the horns with one another and with a rudimentary vagina. The ovaries are sometimes well developed, so that ovulation takes place. The breasts and external genitals may be fully formed.

The *uterus unicornis* (fig. 138) may exist with or without a rudimentary second horn. The vaginal portion of the cervix is small; the palmæ plicatæ within the cervical canal are most marked towards the non-developed side. The body of the uterus is of disproportionate length and curves towards one side. The fundus, by which we understand the fully-developed horn, is small and tapering; it has only one Fallopian tube and ovary connected with it. On the convex side of the somewhat curved body is the representative of the other horn which is either solid or hollow; it is connected with the developed one by fibrous tissue which may or may not form a pervious canal. Connected with this rudimentary horn are the Fallopian tube and ovary of the same side, which are sometimes perfectly developed. In examining preparations of this and other uterine malformations, it is sometimes difficult to determine what is rudimentary horn and what is Fallopian tube. Here development furnishes us with a guide. The insertion of the round ligament indicates the point up to which the ducts of Müller

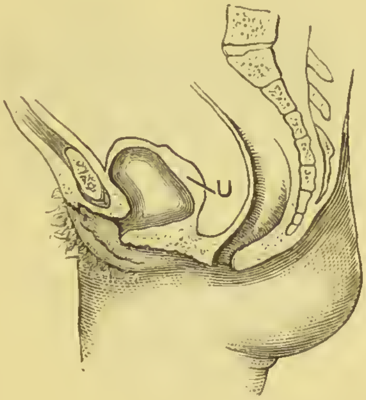

FIG. 135.

The same in its relation to the Pelvic Organs. *U* Rudiment of Uterus on the posterior wall of Bladder. The Peritoneum forms one pouch between Bladder and Rectum (*Schroeder*).

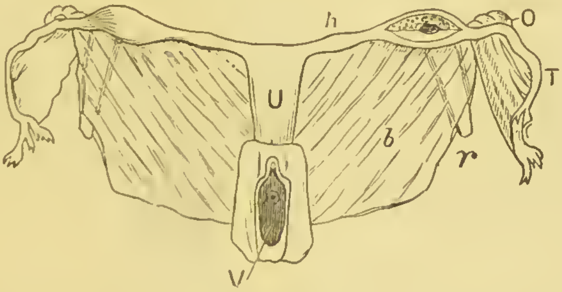

FIG. 136.

UTERUS BIPARTITUS (*Rokitansky*). *V* Vagina; *U* Uterus; *h* Rudimentary Horn; *O* Ovary; *T* Tube; *r* Round Ligament; *b* Broad Ligament.

Round Ligament indicates junction of Uterine Horn and Tube.

are to be formed first into uterine horn and then into corpus uteri. Accordingly, on examining such preparations we determine the point of *attachment of the round ligament*; all below this is uterine horn, all above it is Fallopian tube. Associated with this malformation we sometimes find absence or rudimentary condition of the kidney of the same side, since the development of the renal is closely connected with that of the generative system.[1]

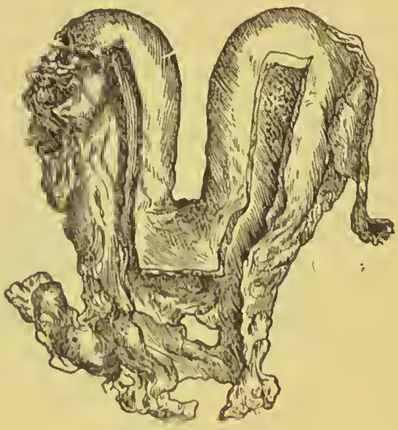

Fig. 137.
Uterus Didelphys (*Coats*)

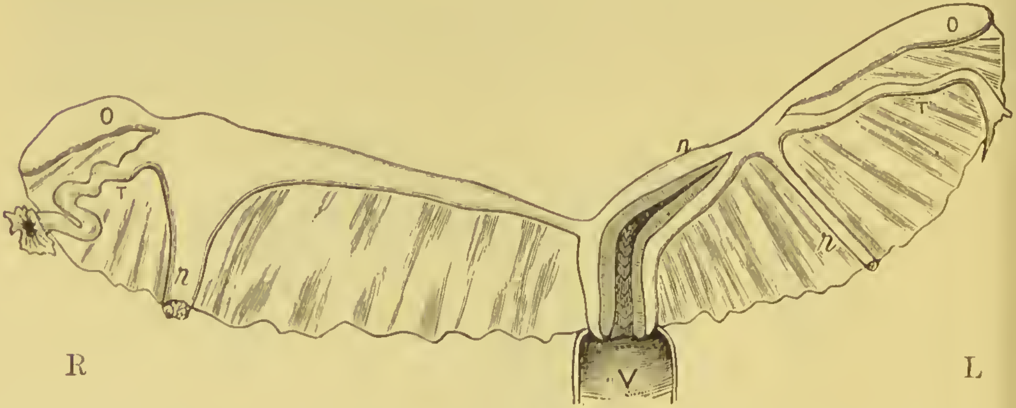

Fig. 138.

Uterus Unicornis (*Schroeder*). *R* Right side; *L* Left side The left horn (*h*) is well developed, and communicates with the Uterine Cavity. The right horn is in the form of an elongated band; its point of connection with the Fallopian tube is indicated by the insertion of the round ligament which is hypertrophied. Other letters as in preceding diagrams.

Uterus Didelphys.

In the *uterus didelphys* the two halves of the uterus remain separate throughout their course; the vagina may be absent, single, or double. It is a rare condition in the living adult female; Pfannenstiel, who has studied it in relation to pregnancy, has collected eighteen cases, and other cases have been reported by Simon and Löhlein.[1]

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[1] Thus the right kidney and ureter were found absent, *post-mortem*, in a girl of twenty-one, in whom the right uterine cornu and part of the tube were also absent. Virchow's Archivs, 1896, p. 138.

Fig. 137 shows a uterus described by Paterson and Coats from a patient who died a fortnight after the delivery of a seven months' child.

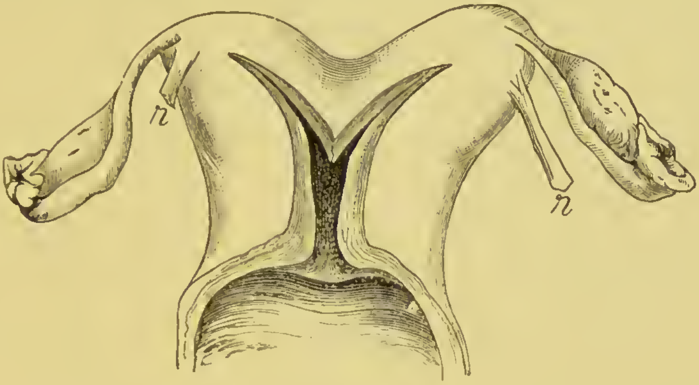

Fig. 139.

Uterus Bicornis Unicollis (*Schroeder*). *r* Round Ligament.

There are apparently two uteri, which are separate, but open into a common vagina; they are of nearly equal size—the right which contained the fœtus measuring 5 in. and the left 4¾ in. in length, and being respectively 2½ and 1¾ in. in breadth.

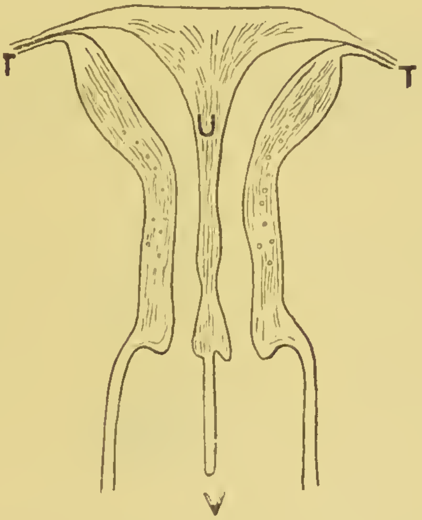

Fig. 140.

Uterus Septus in Vertical Transverse Section (*Kussmaul*). *U* Uterus, placed on septum which divides Cavity into two lateral portions; *T* Fallopian Tubes; *V* Vagina divided into lateral cavities by prolongation of septum downwards.

A case in which there was an accessory or *third* uterus has also been described.[2] There were no uterine appendages connected with it, and it probably originated as a diverticulum on one duct of Müller, the two other uteri arising each from its own duct.

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[1] Centralb. f. Gyn., 1894. S. 997 and 1313.

[2] *Holländer*: Berlin. klin. Wochens., 1894, p. 452. See also case by Depage, Archiv de Toc., 1894, p. 550.

Uterus Bicornis.

By *uterus bicornis* we understand that the separation into two horns is distinctly visible *externally*. Of this there are various degrees, from a mere depression at the middle of the fundus to a well-marked bifurcation, which rarely extends lower than the os internum; the further down the separation extends, the more obtuse is the angle between the divergent horns. There is occasionally a fold of peritoneum, containing muscular fibre and blood-vessels, running from the bladder to the rectum in the hollow between the horns. In addition to this external division, the separation is usually carried further down by an internal septum which may extend to the os externum.

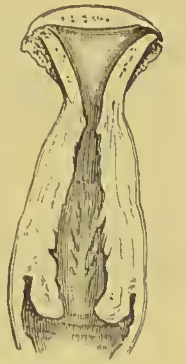
FIG. 141.
INFANTILE UTERUS (*Schroeder*).

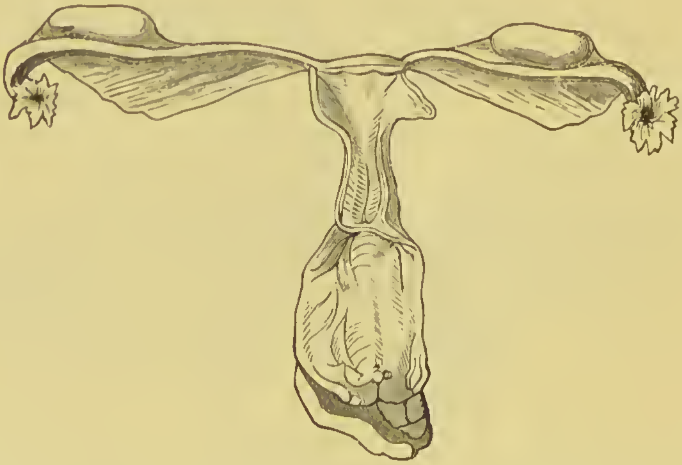
FIG. 142.
PRIMARY ATROPHY OF THE UTERUS (*Virchow*).

Uterus Septus.

In the *uterus septus* (fig. 140) there is no external indication of the internal division. The uterus is divided by a septum beginning at the fundus uteri and extending downwards for various distances, sometimes as far as the os externum. It is otherwise normal.

Various other conditions have been described, such as a septate vagina with two cervices, and apparently a single uterine cavity,[1] or a double cervix with a single uterine cavity above and vagina below.

The presence of *septa* at various points in the vagina or uterus, or of *sacs with an accumulation of blood or pus* alongside of a patulous tract, or of transverse septa causing *complete occlusion* usually point to defective development of one or other duct at a point in its course.

Infantile Uterus.

The *infantile uterus* (fig. 141) is characterised by shortness of body and disproportionate length of cervix; in fact the relative lengths of body and cervix remain the same as at birth, from which the name "*infantile*" is derived. The cervix ($1\frac{1}{2}$ inches long) is two or even three times the length of the body ($\frac{1}{2}$ in. to $\frac{3}{4}$ in.). The whole uterus is smaller than normal. The walls (especially those of the body) are thin and the cavity is small.

Congenital Atrophy of Uterus.

The term *congenital atrophy* is applied to cases in which the proportions of body and cervix are of the normal *virgin* type, while the organ as a whole is atrophied (fig. 142). An excess of connective tissue is present in the walls, which makes their consistence firmer. This malformation occurs in scrofulous and chlorotic patients and with cretinism, and is often associated with hysteria and epilepsy.

ETIOLOGY AND CLASSIFICATION.

Five periods in development of Uterus.

Malformations differ according to the period at which development and growth are arrested, and the extent to which they are interfered with. There are five periods in development and growth (*Fürst*), which can be easily remembered when we bear in mind the division of the period of intra-uterine life into ten *lunar months*. In the first period, which extends over the *first* and *second* lunar months (from fertilisation to the eighth week), the septum between the adjacent ducts of Müller is as yet unbroken. By the end of the second period, which corresponds to the *third* month (*i.e.* eighth to twelfth week), the septum has entirely disappeared; but the upper portions of the ducts remain distinctly separate, forming the horns of the uterus and the Fallopian tubes. During the third period, *fourth* and *fifth* months, the angle between the uterine horns disappears so that the base of the uterus becomes flat. In the fourth period, *last five months*, the flattened end of the uterus, between the Fallopian tubes, becomes arched through the development of the fundus. The fifth period extends from *birth to puberty*. During this period no important change takes place till, at puberty, the uterus passes from the infantile to the virgin form. It does not, however, cease to grow till the twentieth year.

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[1] Merttens: *Centralb. f. Gyn.*, 1894, p. 1001.

Classification of Malformations.

We are not yet in a position to refer each malformation in detail to its proper period; but the more perfectly we are able to do this the more satisfactory will our classification be. At present we separate the first four periods from the fifth, and speak of the period of fœtal life in contradistinction to the period of childhood. This forms the basis of our classification.

1. MALFORMATIONS ARISING DURING FŒTAL LIFE. Of these there are the following: *complete absence* or *rudimentary condition* of the uterus; the *uterus bipartitus*, produced by a development of only the upper parts of the ducts of Müller into rudimentary horns of the uterus and Fallopian tubes; the *uterus unicornis*, due to the development of only one duct; the *uterus didelphys*, due to the development of the ducts separately; without coalescence; the *uterus bicornis*, in which the ducts coalesce below, and the horns remain un-united by a fundus above; the *uterus septus*, in which the coalescence of the ducts and development of the fundus take place so that the uterus appears normal externally while internally the septum has persisted. These last three are sometimes spoken of as varieties of the double uterus or *uterus duplex*. The association of an antero-posterior reduplicature of the peritoneum with some cases of uterus bicornis is of interest from an etiological point of view, pointing back to some mechanical cause which kept the ducts of Müller from blending.[1] It is interesting that a rudimentary condition of the uterus has been observed in more than one member of the same family.

2. MALFORMATIONS ARISING DURING CHILDHOOD. Of these there are the following: the *uterus infantilis*, in which the uterus does not undergo the development which should take place at puberty, but remains of the same type as it was at birth; *congenital atrophy* of the uterus, in which it assumes the virgin type, but the organ as a whole is atrophied.

SYMPTOMS.

The symptoms of malformation consist in an *impairment of function*, and hence do not appear until puberty.

In the external appearance of the patient there is not necessarily anything to attract attention. The figure, features, temperament, and voice are of the feminine type, even though the uterus is not developed. The mammæ may be fully formed. The external genitals may be found well formed, as their development is independent of the internal organs.

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[1] See a case reported by Buchanan: Glas. Med. Journ., July 1892.

It is rare, on the other hand, to find a normal vagina present when the uterus is rudimentary.[1]

Sometimes local symptoms absent.

Complete absence and rudimentary condition of the uterus may give rise to no local symptoms, except the non-appearance of menstruation. If the ovaries are developed, ovulation with associated monthly disturbance is present and the accumulation of menstrual blood in a rudimentary horn may call for operative measures to form a channel for its escape. Even on entering married life the condition need not necessarily attract attention; if the vagina be not well developed, the urethra becomes dilated so as to take its place.

Cause of local symptoms.

In the uterus unicornis, menstruation, conception and pregnancy may go on undisturbed in the developed horn. It is the *imperfectly developed horn which gives rise to symptoms*—the result of the retention of menstrual blood and of the products of conception. If the mucous membrane of this horn discharge blood periodically and there be no communication with the uterus to allow of escape, the blood collects and produces a distended sac—a very rare occurrence. It is of great interest to note that we may have a fertilised ovum growing in the isolated horn; we have not space here to discuss how this interesting condition is produced (fig. 143). Of pregnancy in the uterus didelphys Giles has collected eight cases of gestation in the one half, and two of its simultaneous occurrence in both halves.

Uterus bicornis and uterus septus usually produce no symptoms, unless one half of the partitioned uterus does not open into the cervical canal—in which case hæmatometra occurs at puberty[2] (*v.* Chap. XLV.). The statement that the patient menstruates regularly throws the practitioner off his guard. He should remember that the menstrual blood *may flow undisturbed from one half of the uterus while it is accumulating in the other.*[3] In both of these forms we have two possible seats for a growing ovum (fig. 143); and this accounts for super-fœtation, and those curious cases in which an ovum has been expelled in the course of a pregnancy which went on to full-time.[4] When the uterus is double, abortion and premature labour are more frequent; the septum also causes difficulty in delivery, and involution progresses more slowly. It has been noted that a decidua forms in the empty half of the uterus, as it does in extra-uterine gestation, and may be expelled in the puerperium.

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[1] As in cases by Kahn-Bensinger, *Centralb. f. Gyn.*, 1887, S. 377; Grechen, *ib.* S. 493; Mundé, *ib.* S. 670; Steinschneider, *ib.* 1888, S. 49; Zweifel, *ib.* S. 474.

[2] Rarely is there accumulation in *both* halves due to atresia below. Thus Christopher Martin records a case in which the two horns of a uterus bicornis dilated with pus simulated distended Fallopian tube (*Brit. Med. Journ.*, 1896, II., 1289), and Lewers a case of septate uterus in which, through complete absence of the vagina, each half was distended by retained menses. (*Brit. Med. Journ.*, 1896, II., 1131).

[3] Lackie has recorded a case in which, after the retained fluid was allowed to escape, there was an alternating fortnightly discharge from the two halves. *Brit. Med. Journ.*, 1897, vol. II., p. 881.

[4] As in Gray's case (*Glas. Med. Journ.*, XXXI., p. 182) where an abortion took place in the sixth week of a normal pregnancy, and Ross's (*Edin. Med. Journ.*, 1885, p. 131) where there was a twin abortion in the sixth month and a full-time labour three months later.

The anomaly of menstruation during pregnancy has also been thus explained; Henderson found a double uterus in a patient who menstruated regularly during two of her pregnancies—the flow coming probably from the empty cavity.[1]

The uterus infantilis and the congenitally atrophic uterus are characterised by the absence or scantiness of the menstrual flow and the constitutional nervous disturbance which is usually associated with them.

DIAGNOSIS.

Diagnosis of absence of Uterus.

Complete absence of the uterus cannot be diagnosed with certainty in the living subject. A rudimentary condition may be present, and yet not be detected on the most careful examination. To examine cases in which this condition is suspected, we first pass a sound into the bladder and then with one or two fingers of the right hand in the rectum palpate the tissues which lie between the sound and the fingers. It is evident that in such a condition as is represented in fig. 135 the rudiment of the uterus may escape observation, or be considered as a thickening of the posterior wall of the bladder. We now remove the sound from the bladder, as it only reaches to a limited height in the pelvis, and with the left hand on the abdomen make a careful recto-abdominal examination which, under chloroform, gives much more definite information. If we feel two bodies laterally without any distinct body between, it is impossible to say whether these are rudimentary horns or ovaries.

Diagnosis of Uterus Unicornis.

The diagnosis of the one-horned uterus is not easy. The points to rely on are the following: the fundus turns to one side of the pelvis, is tapering, and has only one ovary connected with it. The rudimentary horn and the other ovary lie removed from it.

Of Uterus Didelphys.

The uterus didelphys is rare. A groove on the external surface of the uterus separating it into lateral halves, so that sounds can be passed into the separate cavities without coming in contact, indicates this condition.

Of Uterus Bicornis.

The uterus bicornis is a comparatively frequent condition, and if well marked is easily recognised. Unusual breadth of the fundus, with a slight depression in the centre, points to a minor degree of this deformity.

Diagnosis of Uterus Septus.

The uterus septus is easily diagnosed if the septum extend as far as the os externum, so as to be within reach of the examining finger. If the septum does not extend so far, the condition may not be detected as there is no change in the external form to direct attention to the internal malformation. The sound may pass with equal ease into either cavity, or always into the same, and thus furnish no indication. In a case that came under our own observation the patient was examined frequently during life, bimanually and with the sound, and the uterus pronounced

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[1] Glas. Med. Journ., XIX., p. 276.

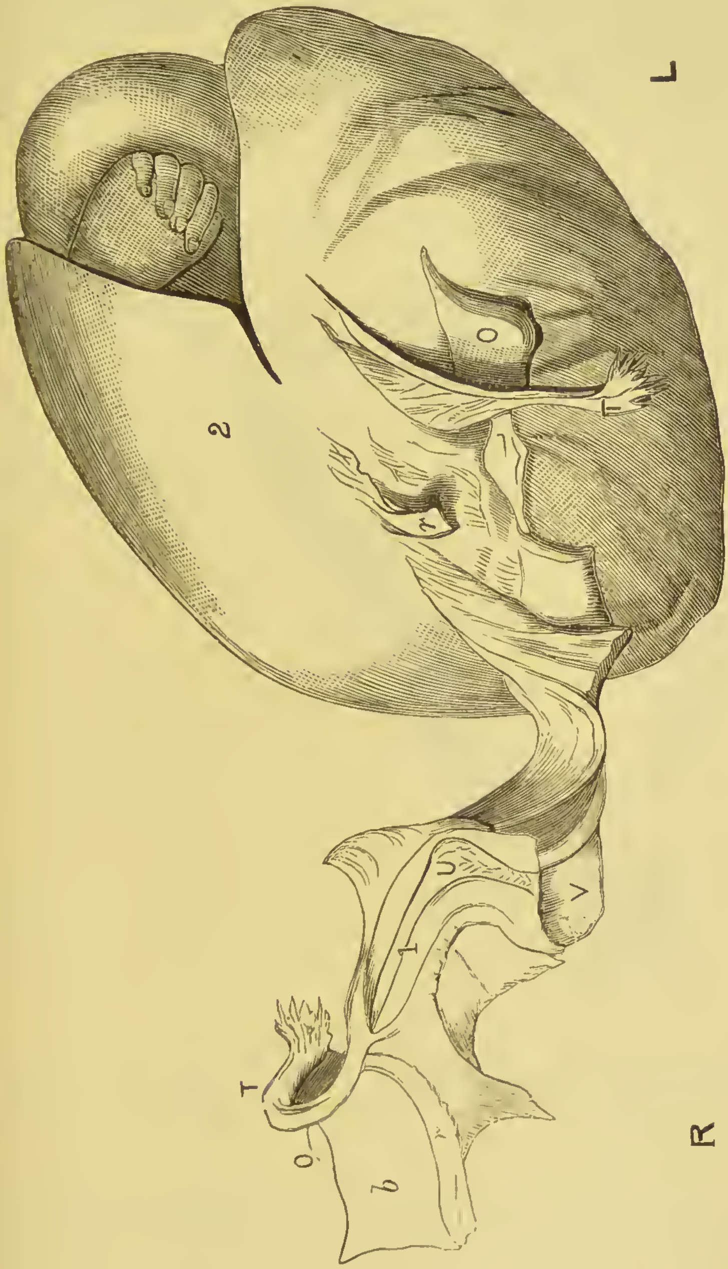

Fig. 143.

One-horned Uterus with Fœtation in the detached Left Horn (*Turner*). The right Horn (1) has its Ovary (*O*), Tube (*T*), Round (*r*) and Broad (*b*) Ligaments in normal relation to it. The Gestation Sac (2) has the left Round Ligament (*r*) attached to it near the Fallopian tube, and therefore is the left Horn; this does not communicate with the Uterine Cavity (*U*). The left Ovary (*O*) and Tube (*T*) are attached near the Round Ligament (*r*).

normal. At the post-mortem the external appearance of the uterus was normal; it was only on cutting into it that it was observed that the cavity was divided into two portions by a septum which extended to the os internum.

Of Infantile and Congenitally Atrophic Uterus.

The uterus infantilis and the congenitally atrophic uterus are recognised by their smallness. This is most distinctly made out with the finger in the rectum, the uterus being at the same time drawn down and fixed with the volsella. The well-developed vaginal portion and the unusual length of the cervix, as felt per rectum, enable us to diagnose the infantile from the congenitally atrophic uterus.

Differential Diagnosis.

With regard to *differential diagnosis*, gestation in a detached horn becomes a condition of great importance to the gynecologist when it simulates a fibroid tumour. The occurrence of irregular hæmorrhages from the empty uterine cavity, the absence of the fœtal heart and uterine souffle when the fœtus is dead, and the difficulty that there may be in palpating fœtal parts, mask the existence of pregnancy. In the cases recorded by Angus Macdonald and Werth, the nature of the case was clear only on abdominal section; Macdonald draws attention to such cases as explaining the phenomena of "missed labour," the occurrence of which might sometimes give a clue.

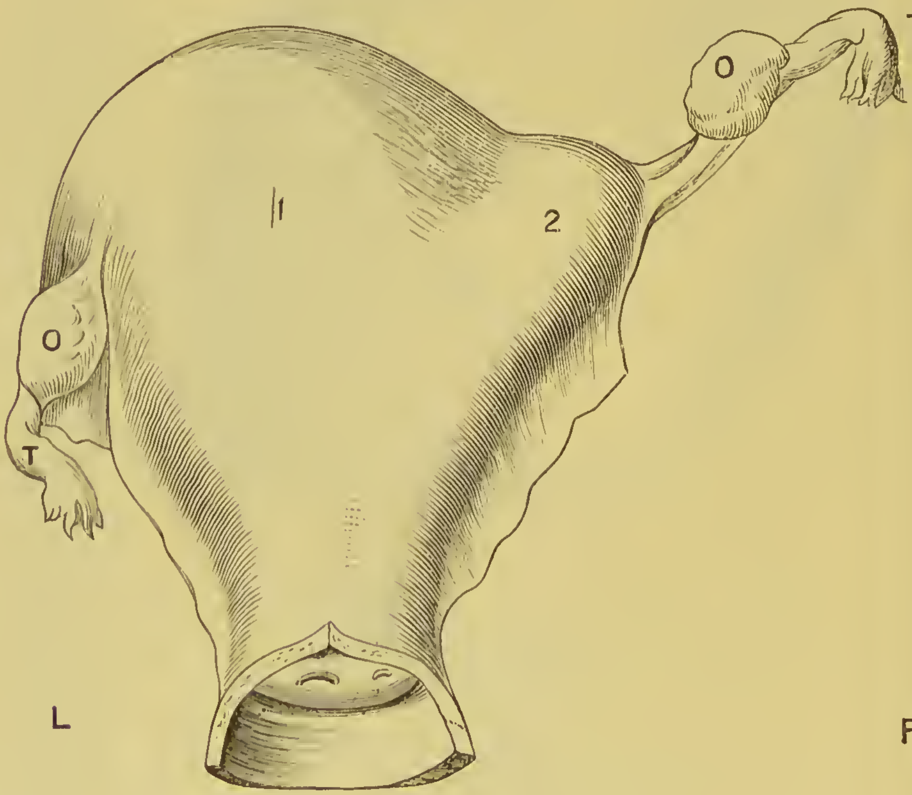

FIG. 144.

UTERUS SEPTUS (posterior view) FROM A WOMAN WHO DIED IN THE PUERPERIUM (*Cruveilhier*). The Uterine Cavity is divided by a septum which extends to the os externum. The left half (1) is strongly developed and contained the fœtus. The right half (2) was empty.

PROGNOSIS.

Prognosis of Malformations.

In prognosis we must keep in view the possibility of ovulation with menstrual molimina, the secretion of menstrual blood and its accumulation in a closed cavity, the probability of conception and of gestation in an isolated horn. The most difficult cases are those in which the practitioner has to decide whether marriage is justifiable or not.

TREATMENT.

Treatment.

Malformations of the uterus lie beyond the range of treatment, except when they give rise to retention of menstrual blood or of the products of conception. The treatment of the former condition will be considered under Atresia of the Vagina (*see* Section VI.), and reference will be made to the latter on the chapter on Abdominal Section. Extirpation of the ovaries has been performed, and even of the uterus or its detached horn for dysmenorrhœa in cases of rudimentary uterus. Cases of congenital atrophy, associated with chlorosis, are amenable to treatment by feeding-up and iron.

CHAPTER XXVI.

SMALL OS EXTERNUM; RIGIDITY, STENOSIS, AND ATRESIA OF CERVIX.

LITERATURE.

Barnes—Diseases of Women: London, 1878, p. 245. *Burton*—So-called Obstructive Dysmenorrhœa: Brit. Med. Jour., 1884, II., 607. *Chrobak*—Die Untersuchung der weiblichen Genitalien: Billroth's Handbuch, Bd. I., S. 106. *Duke*—On the Rapid Dilatation of the Cervix Uteri (with discussion at Brit. Med. Ass.): Brit. Med. Journ., 1888, II., p. 873. *Duncan, Matthews*—On Sterility: Brit. Med. Jour., 1883, I., 702. *Goodell*—Rapid Dilatation of the Uterine Canal: Amer. Jour. Obstet., 1884, p. 1179. *Greenhalgh*—Intra-uterine Pessary: British Med. Jour., June 1878. *v. Grünewaldt*—Ueber die Sterilität geschlechtskranker Frauen: Archiv f. Gyn., VIII., 415. *Herman and Andrews*—A Contribution to the Natural History of Dysmenorrhœa: Lond. Obst. Trans., 1902, p. 371. *Mackintosh*—Practice of Physic: London, 1836, p. 481. *Marckwald*—Ueber die Kegelmantelförmige Excision der Vaginalportion und ihre Anwendung: Archiv f. Gyn., Bd. VIII., S. 48. *Müller*—Die Sterilität der Ehe: Billroth's Handbuch, Bd. I., S. 385. *Schultze*—Ueber Indication und Methode der Dilatation des Uterus: Wiener med. Blätter, 1879, Nos. 42, 43, 44, 45. *Simpson, Sir J. Y.*—Diseases of Women, Edinburgh, 1872, p. 245. *Sims, Marion*—On the Surgical Treatment of Stenosis of the Cervix Uteri, and Discussion: Am. Gyn. Trans., 1878, p. 54. *Vedeler*—Ueber Dysmenorrhœ: Archiv für Gyn., XXI., 211.

ETIOLOGY AND PATHOLOGY.

Etiology and Pathology.

THE various conditions treated of in this chapter have been described mainly from clinical observation and in relation to the symptoms of dysmenorrhœa and sterility. Owing to the absence of exact data, there has been room for great difference of opinion as to the pathology and frequency of these conditions.

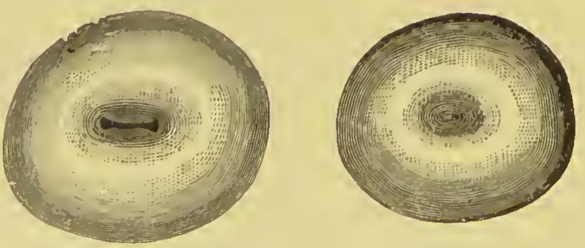

FIG. 145.

A NORMAL AND A PIN-HOLE OS, as seen in the SPECULUM (*Schroeder*).

Small Os Externum.—In a certain number of cases, 6-9°/$_0$ (Vedeler), the os externum is smaller than the normal size; it may be so narrow as to admit only a fine probe (pin-hole os). The contrast between this and the normal os is shown in fig. 145. The cervix is conical in form (fig. 146) and of unusually firm consistence; sometimes it is hypertrophied, the vaginal portion measuring as much as two inches. The cervical mucous membrane is frequently in a condition of catarrhal inflammation; according to Von Grünewaldt, the conical shape of the cervix is often the result of the accumulation of mucus.

Rigidity of Cervix.—The changes in the cervix resulting from an increase of its connective tissue have been fully described by Scanzoni. A peculiarly rigid condition of the cervical tissue, apart altogether from any contraction of the canal, is observed on passing bougies in cases of dysmenorrhœa (Matthews Duncan). A similar condition has been noted as specially frequent in cases of sterility (Olshausen, Martin, and Chrobak).

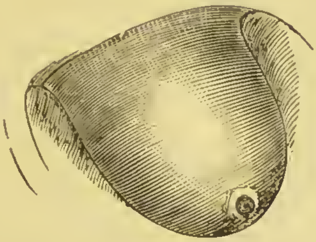

FIG. 146.

CONICAL VAGINAL PORTION (*Barnes*).

Stenosis (contraction) *of the cervical canal* is congenital or acquired. As a *congenital* condition affecting the cervical canal throughout its whole extent, it is a comparatively rare occurrence. It is always associated with smallness of cervix and body, pointing to generally defective development of the uterus (which is further indicated by the scantiness of menstruation). The commonest cause of the *acquired* form is cicatrisation—after labour, after amputation of the cervix, or after the repeated application of strong caustics. Inflammation of the mucous membrane, resulting in adhesions, also produces it.

Atresia of Cervix (ἀ-τρῆσις, non-perforation), or occlusion of the canal, is rare as a *congenital* condition, and is due to the presence of a cap of tissue covering the os uteri. The canal is rarely imperforate throughout its course.[1] An incomplete transverse septum has been described in a few cases.[2]

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[1] Landau records a case of hæmatometra and hæmatosalpinx in which no cervical canal could be demonstrated, even microscopically: "Berlin klin. Wochen.," Feb. 1901.

[2] Budin: "Progrès Médical," 1887.

It is more frequently *acquired*, and results from the following causes:—sloughing and cicatrisation after labour; cicatrisation after the application of caustics, and after amputation of the cervix; adhesion of granulations in cervical catarrh (after menopause), and round the base of tumours.

The practical point for the practitioner to remember is that atresia may follow the repeated application of caustics and amputation of the cervix. It occurs also as part of the physiological changes which take place after the menopause. Twenty-eight per cent. of women above fifty years of age have atresia of the cervix (Hennig).

SYMPTOMS AND DIAGNOSIS.

Symptoms. The symptoms found most frequently associated with these conditions are—

Dysmenorrhœa,
Sterility.

We say "associated," because the relation of the symptoms to the pathological condition is as yet not known. There is no subject in Gynecology round which more discussion has raged, and concerning which there are at present more abrupt differences of opinion.

Dysmenorrhœa.—Mackintosh, from a doubtful analogy between the menstruating uterus and the bladder, introduced dilatation with bougies as a treatment of dysmenorrhœa. The theory was that a stricture prevented the discharge of blood in the former case, just as it prevents a discharge of urine in the latter; and that the pain was due to uterine efforts to overcome obstruction. Sir James Simpson showed that stenosis could not be the only factor, since obstructive dysmenorrhœa might be equally present with a patulous cervix; it depended also on the amount of the menstrual discharge and the danger of its clotting while in the uterus, and may be absent where, though the os is small, the flow is scanty. Marion Sims took up the position that painful menstruation was almost wholly due to mechanical causes, and was the great exponent of what is known as "the mechanical theory." On the other hand, Matthews Duncan maintained that he had never seen a pin-hole os in cases of dysmenorrhœa; and attributed the pain to irregular contractions of the uterus which had nothing to do with expulsion of its contents. Vedeler's investigations have shown that a small os externum is as common in patients without as in those with dysmenorrhœa.[1] Emmet characterised the mechanical theory of dysmenorrhœa as a myth; in his Gynecology, he says that, unless the flow is scanty, painful menstruation is accompanied by clots, but that their formation does not depend upon obstruction.

[1] See also Herman and Andrews, *loc cit.*

Hitherto, conclusions have been drawn almost entirely from the condition of the uterus and cervix between the menstrual periods; and it will be evident from the foregoing how wide is the difference of opinion on the subject. It seems to us that valid conclusions can only be drawn from the condition of the cervix *during menstruation*, and that the diversity of opinion will remain until we have accurate knowledge on this point.

We have called the condition "Small Os Externum" instead of "Stenosis" advisedly; as the latter word implies that there is resistance to the outflow of blood, while the as yet scanty evidence rather seems to show that the canal becomes more patulous during menstruation than at any other time.

Relation of Stenosis to Sterility.

Sterility—When we come to treat of sterility, we shall find that it is frequently associated with dysmenorrhœa. According to the statistics given by Matthews Duncan, as well as those by Marion Sims and Emmet, about one-half of cases of sterility suffer from severe dysmenorrhœa; and two-thirds of Vedeler's cases of dysmenorrhœa in married women were sterile. A narrow os externum, according to the mechanical theory, hinders the upward passage of the spermatozoa just as it retards the downward flow of the menstrual blood. This explanation is evidently open to the criticism that the spermatozoa are microscopic; and that, as Fritsch puts it, a drop of water will fall as easily through a ring of 2 cm. diameter as through a hoop of 100. It is, however, quite possible that a narrow os externum while not absolutely preventing conception may retard it. Müller, in enforcing the very important distinction between absolute and relative sterility, thinks that a contracted os may render conception more difficult, especially where the spermatozoa are scanty in the spermatic fluid. Thus, a counter-illustration to Fritsch's would be that where the drops are few there is more chance of catching them in a bowl than in a thimble. Although there is a general reaction against stenosis *per se* as a cause of sterility, cervical catarrh, when associated with it, is considered by many to play an important rôle through stagnation of the mucous secretion. It has not, however, been proved that a plug of mucus can be an effectual bar to the progress of spermatozoa, and catarrh is a very frequent condition in parous women.

A rigid condition of the cervix has, as already said, been frequently noted as present in cases of sterility. Matthews Duncan suggested that it operates through checking spontaneous dilatation of the cervix during coition.

In studying the complex question of sterility (*v* Section IX.), the at first too obvious mechanical causes sink into insignificance as soon as we come in sight of the less obtrusive and more subtle physiological and vital considerations; and, after a careful survey of the literature, we come to the conclusion that any discussion of sterility in which mechanical considerations have a prominent place must be inadequate and will always be bootless.

DIAGNOSIS.

Diagnosis of Stenosis of the Cervix.

A history of dysmenorrhœa and sterility will lead us to suspect that one of these conditions of the cervix may be present. On vaginal examination, the finger recognises the conical shape and firm consistence of the cervix. In cases of small os externum, the first impression is that it is altogether absent; but more careful examination detects a slight depression. The speculum shows the appearance represented in figs. 145 and 146. The sound is passed with difficulty: but we must remember that difficulty in passing the sound is quite unreliable as a test of the canal's being relatively narrower at a given point; a sharp flexion, a projecting tumour or even a fold of mucous membrane may arrest the sound. Burton by passing the sound in six cases of dysmenorrhœa during the height of the pain made the interesting observation that the canal was more patent then than at any other period.

PROGNOSIS.

Prognosis.

This must always be guarded, as the etiological relationship between the conditions of the cervix described and these symptoms is still *sub lite*, and the results of our empirical treatment correspondingly uncertain.

TREATMENT.

The methods of treatment are—

A. Dilatation.
B. Division.

Dilatation for stenosis is carried out by passing graduated bougies, or by expanding metal dilators. Division is effected by the knife or by scissors. We here consider only dilatation for stenosis; its use for intra-uterine medication will be dealt with under the treatment of Endometritis.

A. Dilatation.

Treatment of Stenosis by Dilatation.

Sponge and laminaria tents were formerly used, but are now abandoned because of the dangers of sepsis.

Dilatation by means of *graduated bougies* was brought into prominent notice by Mackintosh, who employed straight metallic bougies of different degrees of thickness. He passed first a small one not thicker than a probe, and then larger ones till the canal was rendered quite patulous. A No. 9 bougie is the largest size which will pass through a virgin cervix. We have, therefore, to begin with one of smaller calibre, say 6 or 7, and go up to a No. 11 or 12, as the cervix must be overstretched to effect a cure. The graduated dilators (see fig. 85) are also used in the same way.[1]

Various dilators with *expanding blades* have been devised, to complete the dilatation begun with the graduated dilators. Fig. 86 shows the form used by Schultze. Ellinger has made a dilator so constructed that the blades remain parallel to one another while being separated; Goodell has had very good results from forcible dilatation with this instrument both with regard to Dysmenorrhœa and Sterility. The dilator employed by Marion Sims is seen at fig. 87. Other forms have been introduced by Reid, Duke, and More Madden.

Treatment by dilatation is so far empirical as it is done not to remove the stenosis but to relieve dysmenorrhœa when it is associated with it. The cases most likely to be cured by dilatation are those in which the pain is at the commencement of the flow, not for a day or two before it, and is of a spasmodic character (Herman and Andrews). The results are not always satisfactory, many cases being relieved only for a time.

B. Division.

Treatment of Stenosis by Division.

Division of the cervix with the knife was introduced by Sir James Y. Simpson. The instrument which he devised for this purpose was the *metrotome*—a bistoury caché, with a single blade sharp on the outer edge which is unsheathed on compressing the handle.

The effect of division is that the narrow circular os becomes an orifice with gaping lips, and thus resembles that of a multipara (*cf.* figs. 147 and 148).

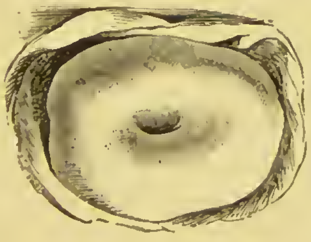

FIG. 147.

NULLIPAROUS OS UTERI (*Sir J. Y. Simpson*).

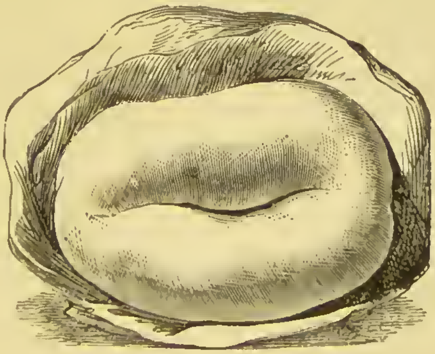

FIG. 148.

PAROUS OS UTERI (*Sir J. Y. Simpson*).

The objection to the metrotome is that we do not know how deep the incision is being made, and it has been abandoned for the scissors.

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[1] Auvard has devised tubular dilators, so constructed that the next size larger can be slipped over the previous one *in situ*: *Archiv de Toc.*, 1894, p. 814.

Kuchenmeister has devised scissors with a hook (fig. 149) in the external blade to keep it from slipping off the cervix, but a pair of ordinary scissors does perfectly.

Operation for Bilateral Division of Cervix.

The operation is performed as follows. The patient is placed in the semiprone or lithotomy position. The Sims speculum is passed, and held by an assistant. The vagina should be thoroughly douched beforehand with an antiseptic. The anterior lip of the cervix is laid hold of with the volsella; the scissors are introduced, and the cervix divided for one-third bilaterally, or posteriorly up to the fornix. To control any hæmorrhage and prevent union of the cut surfaces, a catgut stitch is passed through the face of each cut surface, so as to approximate the vaginal and cervical mucosa.

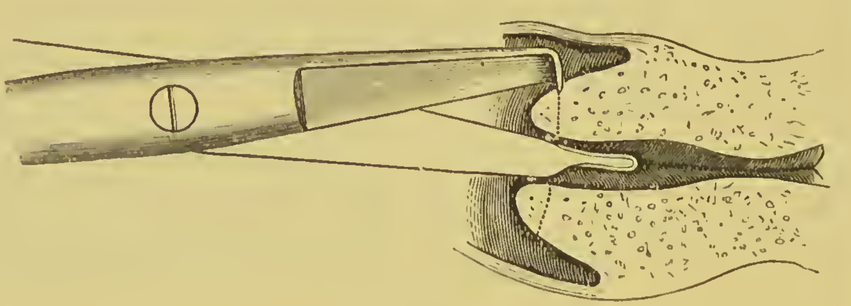

Fig. 149.

Showing the Bilateral Division of the Cervix, with Kuchenmeister's Scissors (*Barnes*).

As will be evident from what has been said under Symptoms, the scope of this operation is very limited unless we have recourse to it as a stage in treating cervical catarrh in a nullipara.

Excision of a portion of the cervix is also done with a view to convert the stenosed into a gaping os like that of a multipara. The operation is similar to that done in amputating the cervix (*v.* fig. 155).

Treatment of Atresia.

Atresia of the cervix is chiefly of importance in regard to the accumulation of menstrual blood or mucus above the obstruction. It is this which produces the Symptoms and calls for Treatment. It will be better to defer the consideration of these till we treat of Atresia Vaginæ (Section VI.).

CHAPTER XXVII.

ATROPHY OF THE CERVIX AND UTERUS: SUPERINVOLUTION.

Conditions under which Atrophy of Uterus occurs.

We meet with an atrophic condition of the cervix and uterus under five different conditions:—

1. As a congenital condition;
2. Associated with certain constitutional affections, as phthisis, scrofula, chlorosis;
3. In acute general affections as scarlet, and typhus fever, and local conditions as parametritis atrophicans;
4. In the puerperal uterus, as the result of superinvolution;
5. After the menopause.

According to Gottschalk,[1] atrophy occurs physiologically (superinvolution) or pathologically; and the latter is primary (the cause being uterine, *e.g.*, endometritis, presence of tumours, parametritis posterior), or secondary to affections of the tubes and ovaries or more general conditions.

Should the student find on vaginal examination that the cervix is small and projecting only slightly into the vagina, and on bimanual examination that the body of the uterus is found with difficulty and is smaller than it should be, he must next ascertain which of the above-mentioned causes has produced the atrophy.

The history will enable him to form his diagnosis. With the *congenital condition* there is a history of amenorrhœa or scanty menstruation since puberty, of sterility if the patient has entered married life, and of hysteria and other disturbances of the nervous system which usually accompany imperfect development of the uterus. The *constitutional condition*, and especially the state of the blood and of the lungs, in other cases enables him to account for the condition of the uterus. Probably the small uterus found in chlorotic patients is a congenital condition, and not secondary to the constitutional state. If the atrophic condition be the result of *superinvolution*, there is a history of childbirth or abortion with non-appearance of menstruation after it. With regard to the *menopause*, the age of the patient is the chief guide; we must remember the possibility of an early menopause, as early as at the age of thirty-five.

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[1] Beitrag zur Lehre von der Atrophia Uteri: Samml. klin. Vorträge N.F., No. 49, 1892.

The only atrophic condition which we shall consider here is that occurring in the puerperal uterus as the result of superinvolution.

SUPERINVOLUTION OF THE UTERUS.

LITERATURE.

Engström—Zur Kentniss der puerperalen Hyperinvolution der Gebärmutter: Festsch. d. 50 jähr. Jub. d. Gesell. f. Geb. u. Gyn. zu Berlin. *Frommel*—Ueber puerperale Atrophie des Uterus: Zeits. f. Geburts. und Gynäk., Bd. vii., H. 2, S. 305. *Jaquet*—Ueber Atrophia Uteri: Berl. Beiträge zur Geburts. und Gynäk., Bd. ii., S. 3. *Johnson T. J.*—Superinvolution of the Uterus: Am. Gyn. Trans., 1883, p. 1064. *Klob*—Patholog. Anatom. der weib. Sexualorgane: Wien, 1864, S. 205. *Ries*—Ueber die Atrophie des Uterus nach puerperaler Erkränkung: Zeits. f. Geb. u. Gyn., Bd. xxvii., S. 38. *Simpson, A. R.*—Superinvolution of the Uterus: Edin. Med. Jour., May 1883. *Simpson, Sir J. Y.*—Morbid Deficiency and Excess in the Uterus after delivery: Selected Obstetrical and Gynecological Works, 1871, p. 595. On Superinvolution of the Uterus and Amenorrhœa: Diseases of Women, Edin., 1872, p. 597. *Thorn*—Zur Laktationsatrophie des uterus: Zeitsch. f. Geb. u. Gyn., Bd. xvi., and Centralb. f. Gyn., 1894, S. 716.

PATHOLOGY.

The uterus is small. Its external length may be reduced from the normal 3 to $1\frac{3}{4}$ inches. The walls are thin and flaccid, sometimes of a dense and fibrous consistence. The vaginal portion projects only slightly into the vagina, and may be almost flush with the vaginal roof. The os may be relatively patulous, or contracted so as only to admit a probe. The uterine cavity is reduced to $2\frac{1}{4}$, 2, or even $1\frac{1}{2}$ inches in length. The ovaries are atrophied, and sometimes show an increase of fibrous tissue in their structure. The accompanying specimen (fig. 150), described by Sir James Simpson, illustrates these points.

Ries found the mucous membrane atrophied or absent, and a small-celled infiltration of the muscular tissue. In one case the muscular fibre was in great part replaced by connective tissue and thrombi. His preparations were taken from cases of death from puerperal sepsis in which the changes may have been more pronounced than usual.

Engström distinguishes an excentric atrophy in which the walls are thin and flabby, but the cavity not diminished, from a concentric in which the whole organ is shrunk.

ETIOLOGY.

As to the frequency of this condition, A. R. Simpson found it present in 22 out of 1300 cases, that is in about 1·7 per cent.; Frommel estimates its frequency at 1 per cent. The reason why, in certain cases,

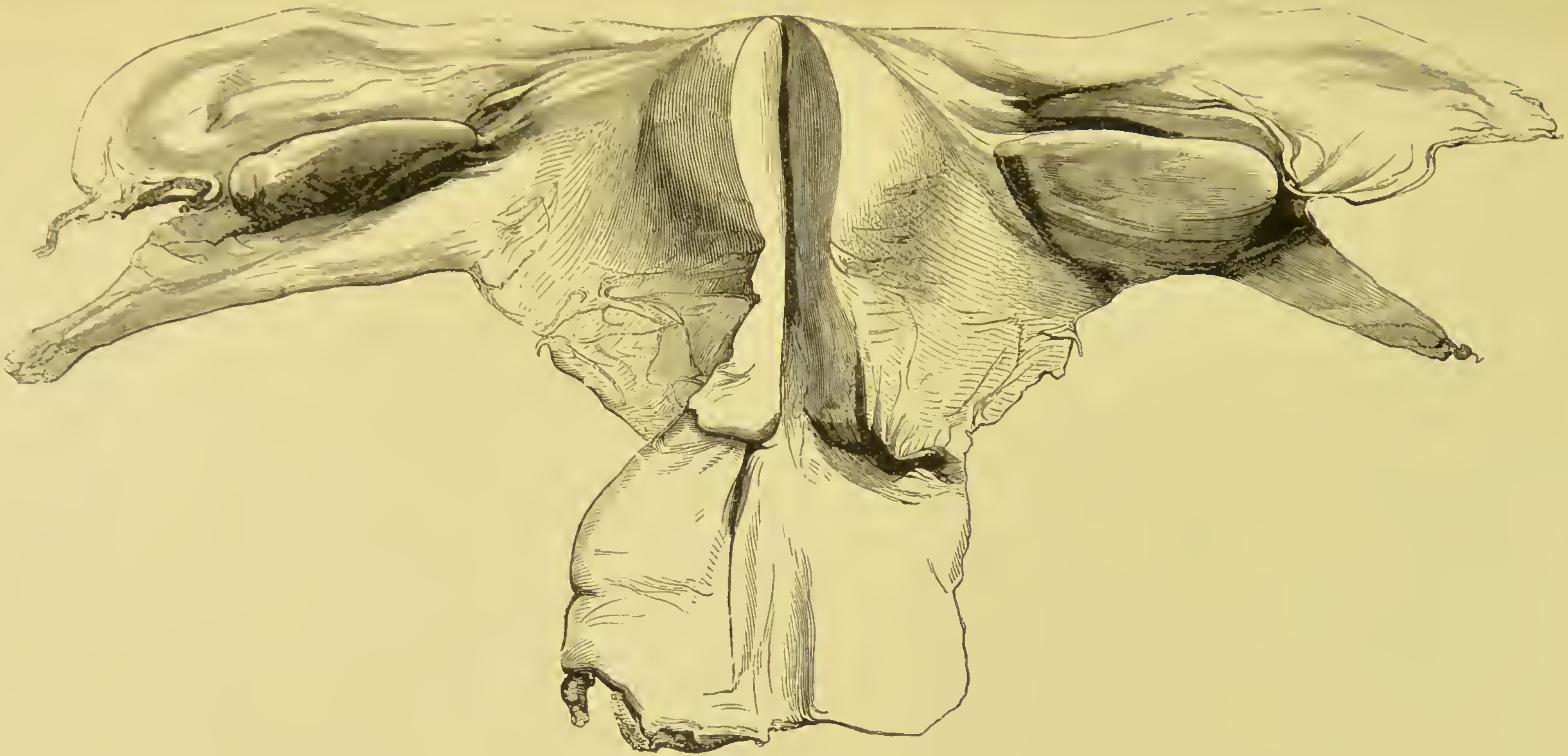

FIG. 150.

PREPARATION OF UTERUS AND OVARIES IN A CASE OF SUPERINVOLUTION, *ad naturam.* Weight of parts represented—one ounce, four drachms, twenty-five grains. Uterine cavity measures 1½ in. Thickness of posterior uterine wall (laid open in figure) ¼ in. Tissue of uterus, dense and fibrous. Ovaries atrophied, with increase of fibrous tissue and no appearance of Graafian vesicles (*Sir J. Y. Simpson*).

the process of involution during the puerperium goes on till the uterine cavity is reduced to less than 2½ inches in length is not known. A condition of transitory superinvolution is according to Thorn not infrequent. During lactation the uterus becomes atrophied due to a reflex tropho-neurosis, and returns to its normal size afterwards. Engström does not attach much importance to the direct stimulus from nursing, but accounts for atrophy whether transient or permanent by general anæmia which he found present in almost all his cases. In some instances there is a history of great *loss of blood* at the confinement (A. R. Simpson). In other instances *pelvic peritonitis* has occurred during the puerperium; this can produce, we know, atrophy of the ovary through binding it down with adhesions; and atrophy of the ovaries may lead to atrophy of the uterus. As already said *protracted lactation* is also a factor, and any conditions which lead to *anæmia*. It is also associated with the *tuberculous diathesis* (*Klob*).

The term superinvolution has also been applied to atrophy of the uterus following hypertrophy from causes other than pregnancy, *e.g.*, submucous fibroids, and that following operations on the cervix, but it is best to limit it to cases of atrophy after parturition.

SYMPTOMS.

Continued amenorrhœa is the symptom which leads the patient to seek advice. After she has ceased nursing, she expects the flow to return. It does not do so, however, even after months have passed. Pain in the back, weakness and hysterical symptoms are sometimes present.

DIAGNOSIS.

The small cervix at once suggests what the condition is. We sometimes have difficulty in making out the uterus bimanually; here the examination per rectum, combined with the volsella, is useful. The best idea of the size of the uterus is gained by pressing the ball of the finger in the rectum against the isthmus of the uterus, and then moving the uterus upwards and downwards upon the finger which can thus estimate accurately its size; having done this, we make more traction on the uterus to bring it as far down as possible, and examine the ovaries.

The sound must be used with care, as it easily perforates the thin walls of the uterus. It does not pass into the uterus as far as the 2½ in. knob.

Differential diagnosis must be made from—

Congenital malformation;
Congenital atrophy;
Senile atrophy.

PROGNOSIS.

This should always be guarded. The curability of the case depends, as Fordyce Barker has pointed out, on the condition of the ovaries—a point, however, exceedingly difficult to determine. When the patient has the menstrual molimina, and the menstruation though scanty, still persists, we may hope for improvement even though the uterus is small.

TREATMENT.

From the unsatisfactoriness of treatment, such cases may, as a rule be left alone. Iron and constitutional remedies may be tried, and permanganate of potash as in other cases of amenorrhœa.

Local remedies as douching, galvanism, and massage have been recommended. The use of intra-uterine stem pessaries, introduced by Sir J. Y. Simpson, has been abandoned from the risks attendant on it.

CHAPTER XXVIII.

HYPERTROPHY OF THE CERVIX: AMPUTATION.

LITERATURE.

Byrne—Amputation and Excision of the Cervix Uteri: Trans. Americ. Gyn. Soc., Boston, II., pp. 57 and 110. *Dührssen*—Beitrag zur Anatomie, Physiologie und Pathologie der Portio vaginalis uteri: Archiv f. Gyn. XLI., S. 260. *Galabin*—Lond. Obst. Journ. Sept. 1878. *Goodell*—Clinical Notes on the Elongations of the Cervix Uteri: Am. Gyn. Trans., 1880, p. 268. *Hegar und Kaltenbach*—Operative Gynäkologie: Stuttgart, 1881, S. 445. *Huguier*—Mémoires sur les allongements hypertrophiques du col de l'utérus: Paris, 1860. *Leblond*—Operative Gynécologie: Paris, 1878. *Marckwald*—Ueber die kegelmantelförmige Excision der Vaginalportion, etc.: Archiv f. Gyn., Bd. viii., S. 48. *Müller*—Die Amputatio Colli Uteri: Zeitschrift für Geburt. und Gyn., Bd. ix., S. 178. *Perdrizet*—Des amputations du col de l'utérus: Archiv de Toc., Aug. et Sep. 1894. *Schroeder*—Charité-Annalen, 1878. Zur Technik d. plast. Op. am Cervix Uteri: Zeitschrift für Geburt. u. Gyn., Bd. iii., S. 419; Bd, vi., Hft. 2, S. 218. *Simon*—Monatsch. f. Geburtskunde, xiii., S. 418. *Sims, Marion*—Uterine Surgery, 1866. *Stratz*—Ueber einseitige Hypertrophie des untern Cervicalabschnitts: Zeits. für Geb. und Gyn., Bd. xii., S. 229.

In this and the following chapters we consider hypertrophy, lacerations, and inflammation of the cervix. Tumours and new growths will be considered with those of the uterus.

Hypertrophy of the whole uterus occurs in two forms:—

1. Hypertrophy of the muscular tissue—in pregnancy;
2. Hypertrophy of the connective tissue—in subinvolution and chronic metritis, both of which will be considered under Chronic Metritis (Chap. XXXII.).

Hypertrophy of the cervix alone calls for special notice here.

HYPERTROPHY OF THE CERVIX.

Under this head we consider two conditions:—

A. Hypertrophy limited to the vaginal portion, which is a distinct *primary* lesion;

B. Hypertrophy of the supra-vaginal portion, which is usually associated with hypertrophy of the body of the uterus; this occurs in prolapsus uteri and is probably *secondary* to that condition.

A. HYPERTROPHY OF THE VAGINAL PORTION.

Hypertrophy of Vaginal Portion.

Pathology.—The characteristic of this condition of the cervix is a great increase in length, affecting it equally all round[1] (fig. 152). The mucous membrane and the subjacent tissue are not thickened, so that the diameter of the cervix is not much increased. As the result of the increase in length, the conical apex of the cervix comes to lie immediately behind the hymen, and may protrude through the vaginal orifice (fig. 151). The os externum is often small.

Etiology.—This condition is a true hypertrophic growth; it is not very common and the cause of it is unknown. As it occurs in the virgin, it is probably congenital.[2] Sometimes it does not attract attention till the patient enters married life, when it produces as a rule sterility because the form of the cervix interferes with conception.

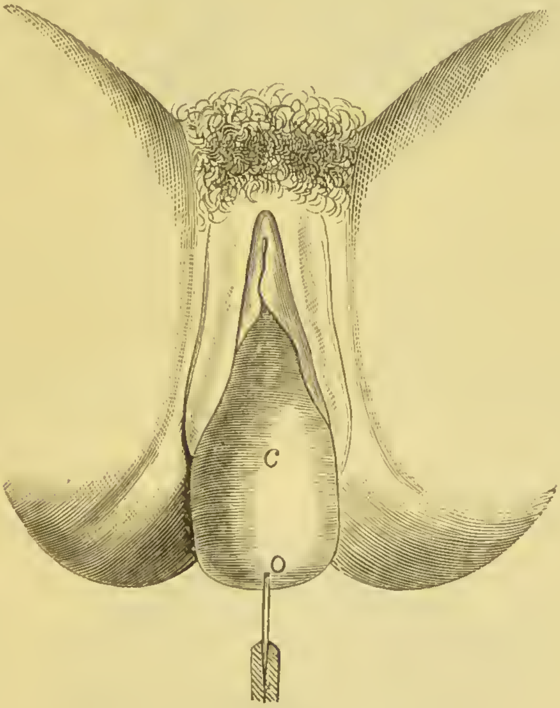

FIG. 151.

HYPERTROPHIED VAGINAL PORTION *c* PROTRUDING THROUGH THE VULVA. The Sound has passed very far into the small Os *o* (*Schroeder*).

The cervix is frequently *thickened* as the result of chronic inflammation consequent on its laceration in childbirth; this is not a true hypertrophic growth, and will be considered under Laceration of the Cervix (Chap. XXIX.).

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[1] Only one case of unilateral hypertrophy in a nullipara could be found by Stratz in the literature—a case recorded by Huguier. Partial hypertrophies are less rare in multiparæ and will be referred to under Laceration of the Cervix

[2] As in a case recorded by Thomson: *Cent. f. Gyn.*, 1895, S. 415.

Symptoms.—The symptoms are due to the presence of the hypertrophied cervix in the vagina. There is bearing-down as in prolapsus uteri, irritation of the mucous membrane of the vagina and consequent leucorrhœa, discomfort on walking about and on rising suddenly. If the cervix protrude beyond the vulva, ulceration of its mucous membrane and excoriation are produced.

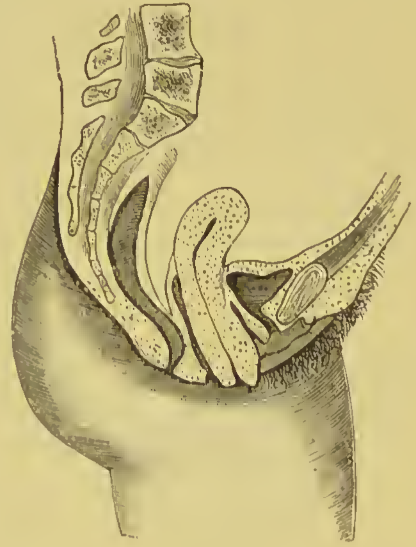

FIG. 152.

HYPERTROPHY OF VAGINAL PORTION OF CERVIX. Neither fornix is obliterated (*Schroeder*). Section of Pelvis seen in fig. 151.

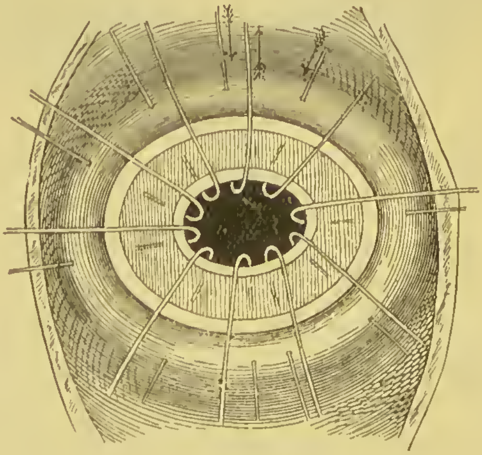

FIG. 153.

Circular amputation (*Hegar v. Kaltenbach*).

Diagnosis.—This presents no difficulty. The fornices are found in their normal position on vaginal examination (see fig. 152) the fundus uteri at its normal height in the pelvis on bimanual examination.

These two clinical facts indicate that the low position of the apex of the cervix is not due to a descent of the fundus but to a hypertrophy of the cervix, and that the hypertrophy of the cervix is limited to the portion which projects into the vagina (*cf.* fig 152 with fig. 158 and fig. 159). The sound may pass five inches or more into the cervical canal; as the patient is usually a nullipara and the abdominal walls therefore firm, it facilitates the Bimanual to do it with the sound in the uterus. The combined recto-vaginal examination shows that the uterus, above the vagina is of normal length.

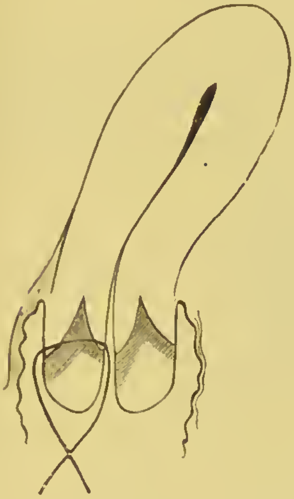

FIG. 154.

SPLITTING THE CERVIX into an anterior and a posterior lip (*Schroeder*)

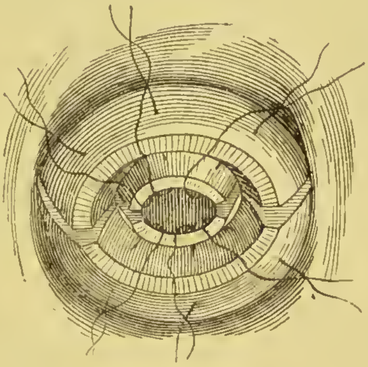

FIG. 155.

EXCISION OF WEDGE from each lip.

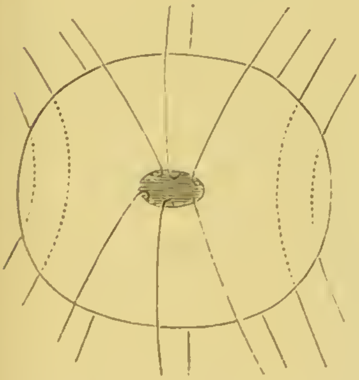

FIG. 156.

POSITION OF SUTURES before they are tied.

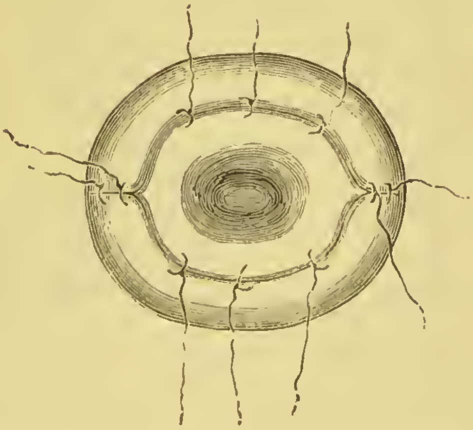

FIG. 157.

APPEARANCE OF STUMP when Sutures are tied.

Treatment.—This consists in amputation of the cervix which is the only course open to us, because the hypertrophy will not diminish but rather increase. Amputation is performed by two methods :—

1. Scissors or knife,
2. Ecraseur, or galvano-caustic wire.

In amputation *with the knife*, we may employ either the circular method (Sims' and Hegar's, fig. 153) or the flap amputation by wedge-shaped excision of the anterior and posterior lips separately (Simon and Marckwald, figs. 154, 155).

Amputation of the Cervix for Simple Hypertrophy.

The operation.—The instruments required are the following :—

Antiseptic douche.
Speculum and spatulæ.
Volsellæ.
Knives and Scissors.
Dissecting forceps.
Strong full-curved needles and needle-holder.
Silk and catgut sutures.

The patient is placed in the lithotomy posture. The external genitals and vagina are thoroughly cleansed. In this as in all operations on the cervix, continued irrigation with an antiseptic douche is an advantage. The speculum and spatulæ are necessary to expose the cervix thoroughly and give room for operative manipulation. It also makes operating easier to have the cervix well drawn down with volsellæ ; but in doing this we must be guided by the mobility of the uterus. In all such operations a careful bimanual should be made just before operating, to determine the condition of the parts round the uterus which can be much more satisfactorily ascertained under the anæsthetic.

The cervix is amputated by the circular or flap method, the latter being the one usually employed. In the former the vaginal mucous membrane is stitched to the cervical all round (fig. 153). In the latter the cervix is split into an anterior and posterior lip, a wedge-shaped portion is cut out of each (figs. 154 and 155); cervical mucous membrane is stitched to vaginal in the centre, and vaginal to vaginal at the sides (figs. 156 and 157). Silk may be used for the central sutures; but the advantage of using catgut throughout is that the patient is saved the inconvenience of having the stitches removed. If silk is used, they are taken out in a week.

Amputation with Ecraseur or Galvano-caustic Wire.

Amputation with the *Ecraseur* or with the *Galvano-caustic wire* is now only used as a palliative measure in some cases of cancer of the cervix (*v.* Chap. XLII).

B. HYPERTROPHY OF THE SUPRA-VAGINAL PORTION.

Diagnosis of Hypertrophy limited to Supra-vaginal portion of Cervix.

The existence of hypertrophy limited to the supra-vaginal portion of the cervix and not affecting the body of the uterus cannot be determined by *clinical* examination alone. The obvious reason is that we have no means of ascertaining in a case of hypertrophy where the precise upper limit of the cervix lies. The position of the os internum cannot be learned from the sound, and the distance to which the utero-vesical pouch of peritoneum descends can only be ascertained on post-mortem examination. We cannot affirm, therefore, that the hypertrophy is limited to the supra-vaginal portion of the cervix and that it does not affect the body of the uterus as well.

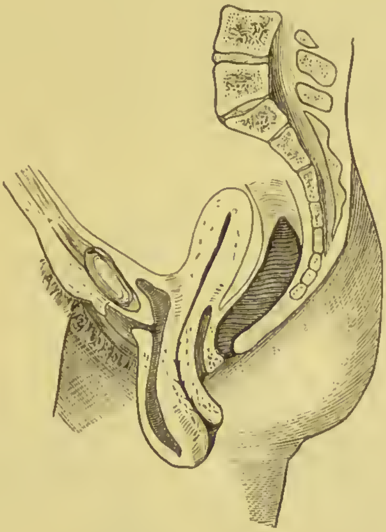

FIG. 158.

HYPERTROPHY OF INTERMEDIATE PORTION OF CERVIX. The anterior fornix is obliterated (*Schroeder*).

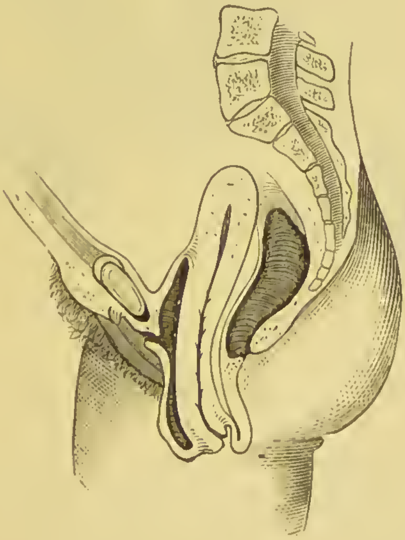

FIG. 159.

HYPERTROPHY OF THE SUPRA-VAGINAL PORTION OF CERVIX. Both fornices are obliterated (*Schroeder*).

In the present state of our knowledge it is impossible to say whether this hypertrophy is primary or secondary. We believe that in the great proportion of cases it is secondary to prolapsus uteri. It has also been described as an exceptional occurrence in the early months of pregnancy.[1]

By French and by many German gynecologists, however, hypertrophy of the supra-vaginal portion of the cervix is considered a distinct primary lesion. Huguier first drew attention to the increase in the length of the uterine canal in cases described as prolapsus uteri; he affirmed that the fundus uteri always remained in its normal position, and that the os externum came to lie outside the vulva *because* the cervix had increased in length; this hypertrophied condition of the cervix was occasioned by a prolapse of the vaginal walls which made traction on the cervix, and thereby stimulated it to increased growth.

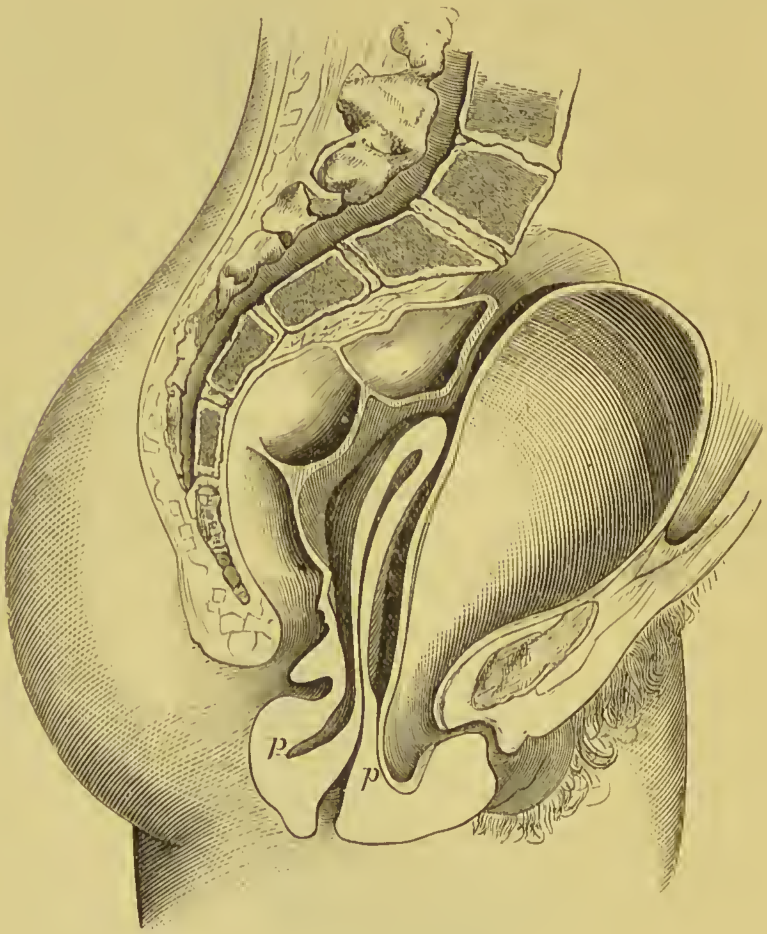

FIG. 160.

PROLAPSUS UTERI WITH ELONGATION (*Barnes*); *p*, *p*, peritoneum.

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[1] By Martin: "Berliner Gesellschaft. f. Geb. u. Gyn.," 1880.

Three forms of Cervical Hypertrophy.

By these gynecologists, three forms of cervical hypertrophy are described according to the portion of the cervix which is hypertrophied. The division of the cervix into three portions—a vaginal, an intermediate, and a supra-vaginal portion—has been already described (*see* page 18). The vaginal portion is limited superiorly by the insertion of the anterior fornix; the intermediate by that of the posterior fornix; the supra-vaginal by the os internum. Hypertrophy of the vaginal portion is characterised by the *persistence of both* fornices in their normal position; it has been already described (*see* fig. 152). In hypertrophy of the intermediate portion the posterior fornix remains, while the *anterior is obliterated* (*see* fig. 158). In hypertrophy of the supra-vaginal portion *both anterior and posterior fornices are obliterated* (*see* fig. 159).

Treatment.—While hypertrophy limited to the vaginal portion of the cervix is very rare, that affecting the whole cervix and usually associated with prolapsus uteri is a common condition, and it was for it that the various modes of amputating the cervix were introduced.

Flap Operation.

In amputating for supra-vaginal hypertrophy, the *relations of bladder and peritoneum* of the pouch of Douglas require to be considered (fig. 160). The bladder invariably descends for a varying distance in relation to the front of the hypertrophied cervix. The peritoneum of the pouch of Douglas, inasmuch as it lines the upper part of the posterior vaginal wall, will, when that wall is everted, dip down alongside of the hypertrophied cervix. If the posterior fornix is not obliterated, the peritoneum will not descend alongside of the protruding cervix.

After drawing the cervix down, a sound is passed into the bladder to define its position. The line of reflection of the posterior vaginal wall indicates how much is vaginal portion, and by cutting within that we avoid the pouch of Douglas. If it is cut into, it should be closed with a buried catgut suture.[1]

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[1] Dührssen advises the use of a buried suture in all cases to prevent retraction of the elastic-tissue layer of the cervix and to lessen the risk of sepsis; but we see no advantage in this, unless the pouch of Douglas be cut into.

CHAPTER XXIX.

LACERATION OF THE CERVIX AND ITS CONSEQUENCES.

LITERATURE.

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Introductory.

THE student will not have gone far in the clinical study of Gynecology without being surprised at the large number of patients who refer the commencement of their illness to a confinement or miscarriage. They come complaining of various ailments—a weak back, pain in the side, white discharge, losing too much at the monthly time, or general unfitness for work. On physical examination, he finds a variety of conditions—a fissured and thickened velvety cervix, thickenings in the lateral fornices or behind the uterus often displacing it by traction, and the uterus itself enlarged. We do not mean that all of these are present in one case, but that one or more of them may be; nor is any one symptom invariably connected with one lesion. He asks himself why labour is so often the starting-point of female complaints; and one important reason, though by no means the only one, is that the tear of the cervix in labour literally opens the door to a variety of lesions. Cervical catarrh is favoured, if not started (as Emmet said), by the split condition of the cervix; the raw surface has admitted septic matter, which leads to chronic inflammation of the parametrium with all the changes in the train of parametritis; and sub-involution is kept up indirectly by the consequent parametritis which Freund has shown to affect the venous and lymphatic circulation in the uterus. It is impossible to consider laceration of the cervix separate from the results which in the great majority of cases follow, and hence this chapter deals with "Laceration of the Cervix and its Consequences." Many of these latter being distinct lesions in themselves, will be treated of separately in the following chapters, and only referred to here in their relation to laceration as an antecedent.

Historical.

For the recognition of laceration of the cervix as a distinct and important lesion we are indebted to the genius of Emmet of New York, who was the first to insist on its clinical significance and elaborate an operation for its treatment.

J. H. Bennet of London had previously described the changes produced in the cervix by its laceration in labour, unfortunately attributing them to a process of ulceration. Roser of Marburg had described the pathology of the condition; but its importance as a factor in uterine disease was brought into notice by Emmet's first paper, which was published in 1869—seven years after he had introduced his operation. Emmet's views as to the importance of lacerations of the cervix have given rise to a great deal of discussion; and their significance is still a *quæstio vexata* in Gynecology.

PATHOLOGY.

Seat, Form and Extent of Laceration.

The commonest *seat* of the laceration is to the front and left side[1] of the cervix, probably because the long diameter of the child's head is most commonly in the right oblique diameter of the pelvis, and the thicker end of the wedge is to the front. The next in frequency is a double laceration—to the front and left, and to the back and right sides. Less frequently is the laceration at either end of the left oblique diameter. We have found lacerations to the front and right side in cases where the head presented right occipito-anterior. The *form* of the laceration is various—single (*see* fig. 161), double (*see* Plate VIII., fig. 2), or multiple (*see* fig. 162). The *extent* of the laceration varies, from a mere indentation of the ring of the os externum to a gaping fissure separating the lips of the cervix up to the vaginal fornices. Occasionally it extends into the roof of the vagina,[1] and is marked by

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[1] According to Emmet and Spiegelberg; Klein and Czempin found right-sided laceration more frequent.

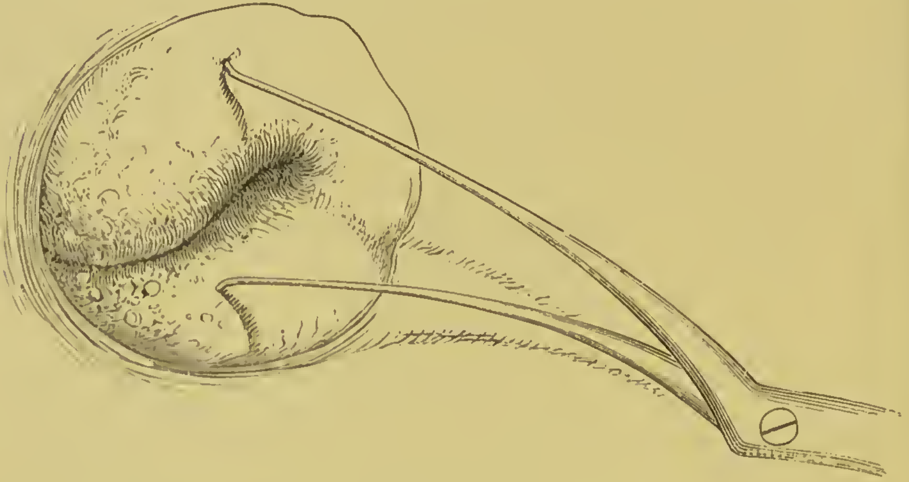

FIG. 161.
SINGLE LACERATION. The flaps are held apart with a double tenaculum (*Emmet*).

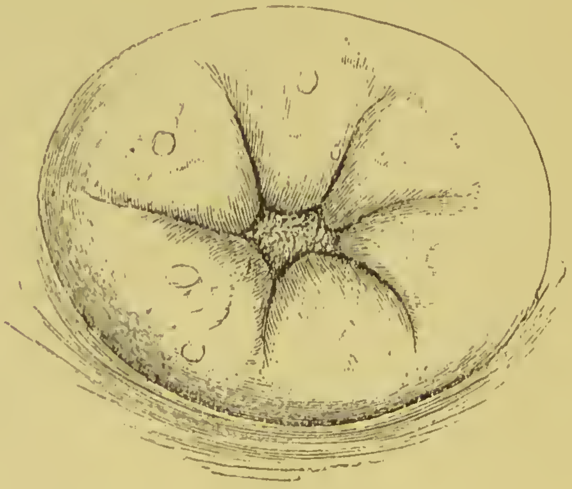

FIG. 162.
MULTIPLE OR STELLATE LACERATION (*Emmet*).

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[1] Czempin, in an extremely interesting paper on cases of laceration of the cervix observed in Martin's Clinique at Berlin, draws especial attention to those tears extending into the fornix, which he describes as "Cervix-Laquearrisse." They are not infrequent (having been present in sixty-eight out of his two hundred and eighty-seven cases), usually unilateral, and more frequent with single than with double tears of the cervix itself. Their symptoms are more marked, due to the changes in the parametrium.

a cicatricial band drawing the cervix to one side; we have noticed this in forceps cases, specially when the forceps had been applied before the os was dilated.

Results.

Among the pathological conditions which are the *consequences of laceration* are the following. One result is that the mucous membrane of the cervical canal is exposed both to mechanical irritation and to micro-organisms; hence the occurrence of cervical catarrh (*v.* following chapter). The existence of the localised cellulitis shows that septic absorption has followed on the tear. The submucous tissue is also thickened and the whole cervix thus hypertrophied.[1] With these inflammatory changes there is *eversion* of the lips of the cervix, although this is sometimes counteracted by the formation of cicatricial tissue in the cleft.

Another consequence is *cellulitis;* frequently we find, on the same side as the laceration, a localised cellulitis in the shape of a distinct deposit, or a tense condition of the utero-sacral or broad ligament, accompanied with tenderness on pressure through the fornix. This tenderness, as well as the constant pain complained of in the side, is probably due to changes in the sympathetic plexus in the connective tissue already referred to under Parametritis. *Subinvolution* of the uterus is also frequently present; there is a formation of cicatricial tissue, which compresses the veins and lymphatics and leads to passive congestion and hypertrophy. The compression of the vessels seems sometimes to have an opposite result, leading to atrophy through stoppage of nutrition.

ETIOLOGY.

Frequency of Laceration.

A laceration of the cervix will be found, according to Emmet's statistics, in 32·8 per cent of parous women; according to Wells, who takes the average of all the various authorities, in 32 per cent. Though it is obvious that lacerations may be produced and heal again so that all trace of them escapes notice, we cannot affirm that the cervix is lacerated with every first full-time labour; but when present, a laceration of the cervix (if we exclude the possibility of the cervix having been divided artificially) *is the most reliable diagnostic of a former parturition.* It must, however, be remembered that a divided condition of the cervix with ectropium of the cervical mucous membrane has been described as a *congenital* condition by Fischel and Küstner; in such cases the everted mucous membrane is not much altered and retains the arbor vitæ.

We should have expected that lacerations would be more readily produced in a rapid labour, in which the os had not time to dilate; Emmet and Pallen, however, have found that they are more commonly the results of tedious labours. Spiegelberg blames early rupture of the membranes done to hasten labour; while Klein finds them most frequent where there is a short interval between rupture of the membranes and delivery of the child, as also where the child is heavy.

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[1] Partial hypertrophies of such a size as almost to form a tumour sometimes, but very rarely occur. Stratz describes three cases, in one of which the tumour weighed 2 lbs. (*Zeitsch. für Geb. und Gyn.*, Bd. xii., S. 229).

Barker and Mundé both draw attention to the fact that they are less common among the wealthy than among the poor. This is probably explained by the better care and longer rest in the puerperium which the former enjoy.

Produced during Pregnancy.

Even *during pregnancy*, according to Nieberding, fissuring of the cervix with ectropium is produced. He examined the cases admitted to the lying-in hospital at Wurzburg at three periods—during pregnancy, as shortly as possible after delivery, and on dismissal. Only in 26°/₀ of the primiparæ examined (thirty-eight cases) was the appearance of the cervix normal during pregnancy; in all the others more or less ectropium was present. In 50°/₀ there were in addition small fissures, which made the os stellate or irregular in form.

SYMPTOMS.

Symptoms of Laceration.

It is very important to know what symptoms are referable to a lacerated cervix. Those who revel in operative treatment ascribe every pathological condition in the uterus to lacerations, while others altogether deny that they have any pathological significance.

We advance the following considerations in regard to the symptoms.

1. Lacerations of the cervix *in themselves produce no symptoms*. Hæmorrhage may arise at the time of production, but is not a symptom of the persistence of the laceration.

2. Other pathological conditions arise secondarily as the result of the laceration, of which the most important are cervical catarrh and cellulitis; cicatricial tissue in the cleft produces reflex nervous symptoms.

We sometimes find a well-marked laceration by chance, as it were, the patient having had no symptoms referable to a pelvic cause.

Frequently she complains of *leucorrhœa* and symptoms common to pelvic or uterine inflammation. *Menstruation* is often irregular, increased in 50°/₀ according to Emmet's statistics; this is in many cases due to subinvolution. *Sterility*, when present, is probably due to the accompanying catarrh; and the *tendency to abortion* to the secondary changes in the uterus or parametrium. *Neuralgia* is sometimes present, which may show itself locally in excessive tenderness to touch at the seat of laceration and has been compared to the sensitiveness present in toothache. In other cases it has taken the form of neuralgic pain in the pelvis generally, often in the groin and extending down the leg, or sympathetic neuralgia elsewhere. Emmet and others record cases in which persistent neuralgia disappeared on excision of the cicatricial plug in a lacerated cervix. Other *reflex disturbances* (such as cataleptic convulsions, persistent salivation, profuse sweating, hysterical anuria) have disappeared after Emmet's operation. *General weakness* and inability to work are present here as in other chronic conditions.

The relation of laceration to malignant disease, of which it seems sometimes to be the starting-point, will be considered under Cancer of the Uterus.

DIAGNOSIS.

This presents, in many cases, no difficulty.

Occasional difficulty in recognition.

The *finger* feels the indentation or fissuring of the vaginal portion. Sometimes the cervical canal is patulous, and admits the distal phalanx of the finger easily. Difficulty in diagnosis arises when there is much eversion of the mucous membrane of the cervical canal with thickening of the cervical tissue; the fissure is thus obliterated, because the circle of the os is not formed of the os externum but of a higher unfissured portion of the canal. This thickening and the velvety feeling of the everted mucous membrane lead us to suspect the condition.

The *speculum* shows the cleft in the cervix with, in the great majority of cases, round it appearances which will be more fully described under Cervical Catarrh. We see a bright red irregular patch on one side of or surrounding the os; from its granular appearance, its vascularity, and the fact that it bleeds easily, it resembles an ulcerated surface. For this reason it is often described as "*ulceration*" of the cervix, but it is no more an ulceration than is the inflamed mucous membrane of the conjunctiva. By ulceration we understand a destruction and loss of tissue. The epithelium and subepithelial tissue may be destroyed as an immediate result of injury during labour; but the raw-looking surface, appearing secondary to and almost independent of lacerations (*see* Catarrh in Nulliparæ), is not an ulcerated surface and should therefore not be treated as such.

As already mentioned (p. 115), Sims' speculum must be used; the other forms only mask the laceration.

For the appearance presented by the various forms of laceration when seen in the speculum, the student should compare fig. 161 and fig. 162. The difference between the colour of the everted cervical mucous membrane and that of the vagina is represented in Plate VIII., figs. 1 and 2.

The microscopic changes which produce the appearance simulating ulceration will be described under Cervical Catarrh.

The *Tenacula* are a valuable adjunct in examination with the speculum. If we place one in the anterior and one in the posterior lip, and roll these in on one another, the raw-looking surface will in many cases disappear. This easily demonstrated fact had not been recognised till Emmet drew attention to it, and based on it the operation which will be always associated with his name. By thus rolling the lips inwards, we restore the laceration and see the extent of it so as to judge of the possibility of approximating the lips with sutures.

TREATMENT.

From what has been said in the introductory paragraph, and also under "Pathology," it is evident that the treatment of laceration of the cervix means much more than the closure of the split. Emmet in his operative procedure not only closed the laceration but excised the cicatricial tissue; he also made his patients undergo a long preparatory treatment directed to the cervical catarrh. The cases calling for his operation are much fewer than might at first sight be supposed,[1] because no laceration however well marked calls for treatment unless it is producing symptoms; and there are other operations (Schroeder's and Martin's) for removing the consequences of laceration superior to Emmet's. Where there is much induration of the cervix, amputation is preferable.[2]

Immediate Operation for Laceration.

The stitching up of a laceration *immediately after parturition* was first performed by Pallen of New York. Having failed to check by the tampon post partum hæmorrhage from a lacerated cervix, he passed Sims' speculum and sewed up the laceration with silver-wire sutures; this checked the hæmorrhage. We have never had occasion to perform the "immediate" operation; injections of very hot water have always sufficed to check hæmorrhage. Considering the liability to septic inflammation in the puerperal condition, we would be very chary about operating unless the hæmorrhage were considerable and not diminished by hot injections.

Emmet's Operation.

The paring of the edges of an *old laceration* and uniting of them with sutures is known as "Emmet's operation," which is a simpler and more suggestive name than "Trachelorrhaphy."

Emmet's Operation for Lacerated Cervix.

The Operation. The following instruments[3] are required:—

Vaginal Douche,
Sims' speculum,
Volsellæ,
Tenacula,
Bistoury and scissors,
Dissecting forceps,
Short needles, straight and curved,
Needle holder,
Catgut.

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[1] Principles and Practice of Gynecology: 1884, p. 483. The conservatism as to this operation which exists in this country is justified by what Emmet said in a letter given in the interesting tabulated record of opinions of the leading operators which Zinke collected, as to when and when not the operation is to be performed; the italics are ours. "The Operation has long since passed out of my hands, and so fully endorsed that I have no fear for its future. The great point is to check the abuse, which is fearful. Every one feels competent to perform it; it is done without the proper preparatory treatment, and with no special purpose. I believe in *nine cases out of ten*, where it is done, or attempted, the execution of the operation is defective and without any benefit to the patient.

[2] See J. D. Emmet's paper as to the limitations of the operation. Also discussion on the Treatment of Cervical Metritis at the 13th International Congress of Medicine, Paris, 1900, where Pozzi recommended that biconical resection replace trachelorrhaphy ("Brit. Med. Jour.," 1900, II., Epit., p. 35).

[3] It is of great advantage, as Martin has pointed out, to curette the uterus before operating on the cervix; this can be done at the one operation, in which case we need the curette, and sounds dressed with cotton-wool dipped in iodine or carbolic acid in addition to the instruments mentioned.

The patient is placed under chloroform in the lithotomy posture; and the field of operation having been thoroughly cleansed, the speculum is passed and the cervix laid hold of with the volsella and drawn down. The uterus may be curetted at this stage, as there is usually endometritis associated with the condition of the cervix. Draw the edges of the laceration together with tenacula to see how much tissue must be pared from the edges of the cleft to allow it to be sewed up, and then proceed to operate. Pare the edges of the laceration with the scissors or knife; scissors are preferable, because they cut with greater ease and rapidity. With long-bladed scissors we can remove the tissue from one edge of the laceration with a steady clean cut right into the angle; Emmet lays great stress on the removal of the cicatricial tissue in the angle but uses the bistoury to do this. When the laceration is bilateral this must be done on both sides. Fig. 163 shows the extent of surface denuded by Emmet in a case of bilateral laceration. Great care must be taken to leave a broad strip (broader than represented in fig. 163) undenuded in the middle line to form the walls of the cervical canal. The sutures are now introduced. Catgut[1] has the great advantage over silver wire, formerly used, that the stitches do not require to be removed afterwards; strong sutures are necessary, as some force is needed to tie

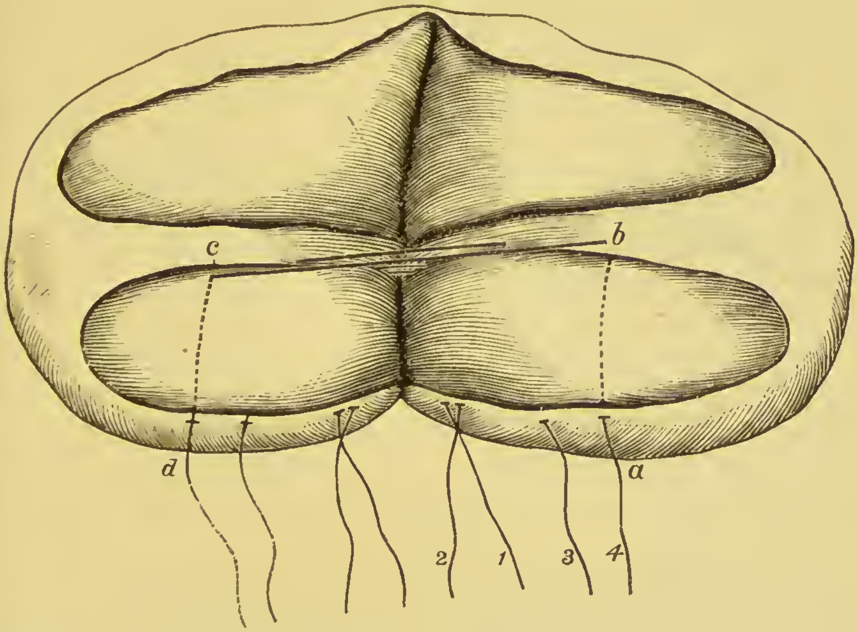

FIG. 163.

EXTENT OF DENUDED SURFACE AND COURSE OF SUTURES ACCORDING TO EMMET (*Emmet*).
The sutures are passed in order 1 2 3 4; the course of suture 4 alone is indicated by letters *a b c d*.

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[1] Meinert recommends passing the catgut right through the cervix and fixing the ends with shot on plates: Eine sichere Catgutnaht für die Emmet'sche Operation: Archiv f. Gyn., XXXIII., S. 310.

them tight. If wire or silk has been used the sutures are removed after ten days.

No special regimen is required afterwards, the diet need not be restricted. Secondary hæmorrhage has sometimes followed the operation: it is best checked by passing a suture through the cervix higher up and tying it tightly on the side from which the hæmorrhage comes so as to constrict the vessels in the cervix.

The effect of the operation on sterility has given rise to a great deal of discussion. Wells gives in his paper an interesting table of statistics as to subsequent conceptions, and affirms that the operation increases fertility; the proportion (one-fourth) of cases fertile after Emmet's operation is, however, the same as Emmet gives for cases of laceration generally, *i.e.* whether operated on or not.

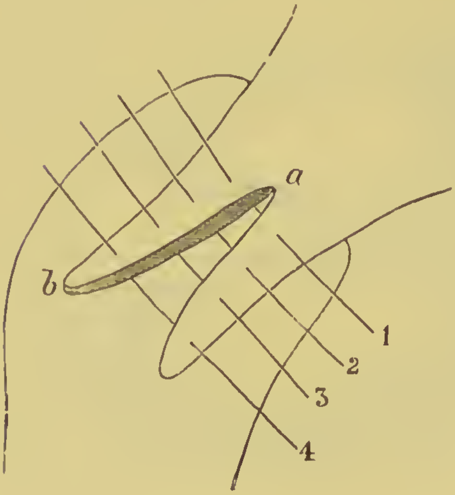

FIG. 164.

MODE OF PASSING SUTURES. *a b* denuded surface as in fig. 163. The sutures are passed in order as numbered.

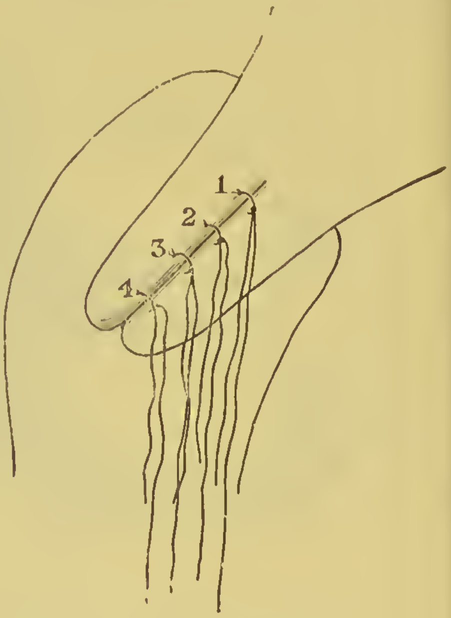

FIG. 165.

APPEARANCE OF CERVIX WITH SUTURES TIED BUT NOT CUT SHORT. If of wire or silk they are left long so as to extend to vaginal orifice and are removed in order as numbered.

The cicatrix does not cause difficulty in subsequent parturition. The cervical catarrh may persist after the operation. Sometimes metritis, cellulitis, or peritonitis has unfortunately followed it.

Other methods of closing the cervical laceration by *flap operations* have been proposed. Sänger[1] and Kleinwächter[2] dissect up a flap of cervical mucous membrane from the faces and apex of the cleft, and turn it in towards the cervical canal. The object of this is to preserve the cervical mucosa, and the result is a wider cervical canal. The operation is analogous to Simpson's one for the repair of the torn perineum, in which the vaginal mucosa is dissected up in a similar way. . Dührssen makes an incision along the middle of each face of the cleft extending into the angle, dissects a flap outwards and inwards, and then everting these flaps brings together the raw surfaces. This operation is similar to what is done in fistulæ, when the margins of the fistula are split, and the flaps turned towards the respective free surfaces. The object of repair of the cervix is not, however, comparable to that of repair of the perineum, or the closure of a fistula. Flap-splitting is called for in these operations to save tissue—to strengthen the perineum or to close in the fistula; while in the case of the cervix we have to do with excess of diseased tissue, either hypertrophied mucosa or new cicatricial formation, which requires to be removed. The cleft is in itself of no significance.

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[1] Cent. f. Gyn. 1888. No. 49, and Volk. Samm. klin. Vorträge N.F. No. 6, July 1890.

[2] Zeits. f. Geburts u. Gyn., XVIII., No. 2.

Operations which simply close a cervical laceration are not of great value. Emmet's operation, which was repeatedly performed when he first drew attention to laceration of the cervix, has been replaced by operations which remove the diseased tissue, such as Schroeder's excision of the cervical mucosa, or this combined with amputation of the cervix, both of which will be described in the following chapter.

For extensive tear into the fornix which has resulted in cicatrisation in the parametrium with lateral displacement of the uterus, Martin has introduced as a special operation[1] the separation of this cicatricial tissue from the cervix. Under chloroform, in the lithotomy posture, the cervix is drawn over with forceps from the affected side and a semilunar incision made in the cicatrix in the fornix, following the contour of the cervix. This may be sufficient; or it may be necessary in addition to cut out a portion of the cicatricial tissue. The antero-posterior incision is then stitched so as to bring front and back together and thus make the line of junction transverse.

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[1] Czempin (*loc. cit.*) gives three cases in which marked symptoms disappeared after this operation, and also a tabular report of nine more recent cases in Martin's clinique with similar good results.

CHAPTER XXX.

CHRONIC CERVICAL CATARRH.

LITERATURE.

Baldy—An American Text-book of Gynecology: London, 1895. *Bennett, G. H.*—Practical Treatise on Inflammation, Ulceration, and Induration of the Neck of the Uterus: London, 1845. *Candia*—L'amputazione della porzione dell' utero come cura radicale delle erosioni e della metrite parenchimale cronica: Annali di Ostet., 1888, 463. *Doléris*—Influence des Opérations Plastiques pratiqueés sur le côl Utérin sur la Conception, la Grossesse et l'Accouchement: la Gynécologie, 1900, p. 132. *Duncan, Matthews*—Diseases of Women: London, 1886. *Fischel*—Ein Beitrag zur Histologie der Erosionen der Portio vaginalis uteri: Archiv f. Gyn., Bd. XV., S. 76. *Fritsch*—Erosionen, Ectropium und Cervicalcatarrh: Billroth u. Luecke's Handbuch der Frauenkrankheiten, Stuttgart, 1885. *Hennig*—Der Katarrh der inneren weiblichen Geschlechtstheile: Leipzig, 1862. *Hildebrandt*—Ueber den Katarrh der weiblichen Geschlechtsorgane: Volkmann's Sammlung klin. Vorträge Leipzig, 1872, No. 32. *Hofmeier*—Folgezustände des chronischen Cervixkatarrhs und ihre Behandlung: Zeitsch. f. Geb. u. Gyn., Bd. IV., S. 331. *Klotz*—Gynäkologische Studien über die pathologischen Veränderungen der Portio vaginalis Uteri: Wien, 1879. *Küstner*—Beitrage zur Lehre von der Endometritis, Erosion und Ectropium: Jena, 1883. *Mundé*—The treatment and curability of chronic uterine catarrh: Amer. Journ. of Obstet., 1883. p. 857. *Pozzi*—Discussion on Cervical Metritis: Proceedings of 13th International Congress of Medicine, Paris, 1900. *Ruge and Veit*—Zur Pathologie der Vaginalportion: Zeitschrift f. Geb. u. Gyn., Bd. II., S. 415. *Schroeder*—Krankheiten der weiblichen Geschlechtsorgane: Leipzig, 1879, S. 122. *Steavenson*—Note on the use of Electrolysis in Gynecological Practice, and Discussion: Trans. Lond. Obs. Soc., June and July, 1888. *Veit*—Handbuch der Gynäkologie: Bergmann, Wiesbaden, 1897. *Vulliet*—De la dilatation permanente de l'utérus: Arch. de Toc., 1886, p. 933.

With cervical catarrh we begin the study of inflammation of the uterus, to which this and the two following chapters are devoted, and with regard to which some general observations must be made by way of introduction. Our knowledge of this subject has been slowly extending with improved methods of investigation. After the speculum had concentrated attention unduly on the naked-eye appearances of the cervix, the introduction of the sound and the curette along with the bimanual examination, brought within range the condition of the uterus itself, and its cavity. And to-day abdominal section has still further extended the field of observation to the uterine appendages. With a wider field there have come corresponding changes in gynecological opinion as to the significance of the different lesions.

In studying inflammation of the uterus, it is convenient to separate inflammation of the cervix from inflammation of the body, and analyse the latter into inflammation of the mucous membrane, endometritis; and of the body generally metritis. While pathological differences between these are sufficiently well marked to warrant this sub-division, clinically it is not always easily made out. Inflammation is not limited in its spread to one tissue, and there is a combination of symptoms which is more or less common to all the forms of uterine inflammation. This has led French writers on gynecology to group the subject matter of these three chapters under the general heading of metritis. Although this simplifies the handling of the subject, and saves repetition, it savours of a return to the symptomatic standpoint from which gynecology has been slowly rising.

In considering uterine inflammation, we must bear in mind that the uterus differs functionally from other organs lined by mucous membrane, such as the bladder, stomach, or lungs. These are in constant use, while the reproductive function is only occasional. We must be careful, therefore, in transferring to the uterine mucosa ideas of inflammation derived from other mucous membranes. An endometritis is not comparable to a gastritis or a cystitis. Many conditions grouped under the heading of "endometritis" are more allied to new-formation than inflammation.

On the other hand, while the reproductive function is occasional, the uterine mucosa is subject to a periodic hypertrophy and degeneration in connection with menstruation. This complicates greatly the study of the morbid changes in the mucosa.

These considerations bear on inflammation of the body of the uterus rather than on that of the cervix. The cervical canal is anatomically more like a mucous membrane than the endometrium. Further, while it takes no part in the changes of pregnancy and menstruation, it is continually secreting a characteristic mucus for the lubrication of the vagina. There is thus a cervical catarrh analogous to a bronchial or gastric catarrh, to the consideration of which the following chapter is given.

Acute catarrh of the cervix is known to us only as part of a general catarrh affecting both body and cervix, and will be described under Acute Endometritis. *Chronic catarrh* occurs localised in the cervical mucous membrane; it is a very common condition and one of the most troublesome which the practitioner has to treat.

Definition.—A chronic inflammatory process affecting the mucous membrane lining the cervical canal.

Synonyms.—Cervical endometritis, Endo-cervicitis.

PATHOLOGY.

The mucous membrane of the cervical canal is inflamed. When the os externum has been lacerated, the lips gape and the mucous membrane is thus everted; on bringing the margins of the laceration together, this eversion will disappear. Further, there are granular patches with irregular outline which extend beyond the limits of the os externum; these have a red appearance resembling the cervical mucous membrane, and are therefore sharply defined from the paler mucous membrane which covers the vaginal portion of the cervix.

Pathology of so-called Ulceration of the Cervix.

This last condition was till late years generally held to be an "ulceration." The cause of the error is easily explained: a raw-looking granular surface was seen with the speculum; the raw appearance was ascribed to the loss of the epithelium, and this supposition was supported by the microscopic examination of specimens taken from the dead body, in which the epithelium had been macerated and removed; the granular points were supposed to be the subjacent papillæ which had become hypertrophied.

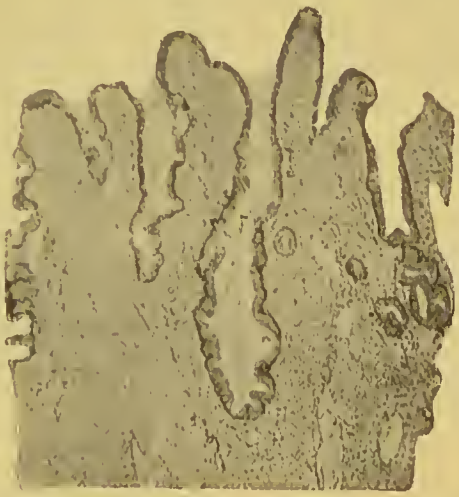


FIG. 166.

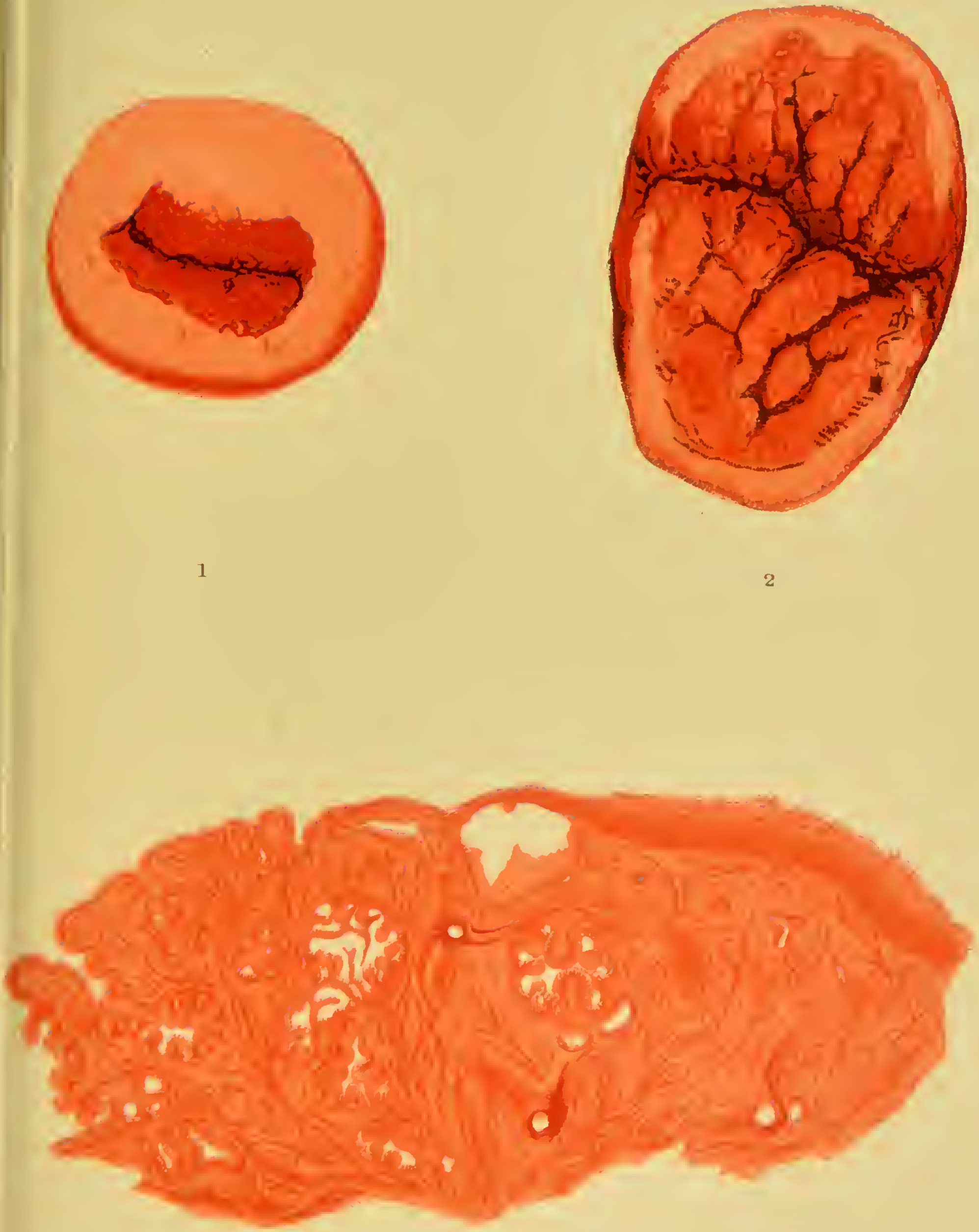
SECTION OF CATARRHAL PATCH, OR PAPILLARY FORM OF EROSION (from a micro-photograph).

Ruge and Veit's Investigations.

Both of these suppositions were shown to be erroneous by the careful investigations of Ruge and Veit, who examined specimens of the so-called ulcerations cut fresh from the living subject; they demonstrated (1) that the apparently raw surface is covered with epithelium, (2) that the granular points are new formations and have no connection with the papillæ of the mucous membrane.

The microscopic appearance of the mucous membrane described by them is as follows. The surface is covered with a single layer of epithelium; the cells are smaller than those which line the normal cervical

PLATE VIII.



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EROSION AND LACERATION OF CERVIX (Ruge and Veit).

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canal, and being narrow and long have a palisade-like arrangement; the thin layer of cells allows the subjacent vascular tissue to shine through, hence the *red* colour. The surface is further thrown into numerous folds producing glandular recesses and processes; these processes cause the *granular* appearance of the surface. The condition is well seen in Plate VIII., and constitutes the *simple* erosion: fig. 1 shows such an erosion as seen with the speculum: fig. 3 shows a microscopic section of the same, stained with carmine; the left half of the section corresponds to the deep red portion of fig. 1, the right half to the paler portion outside of this. If the recesses be long and narrow, the surface is split up into distinct papillæ; this constitutes the *papillary* erosion (*see* fig. 166). If the ducts of the glandular recesses become obliterated, the secretion will distend the gland below and produce retention-cysts; these will increase in size, and may come to the surface and burst. Thus there is formed the *follicular* erosion (*see* fig. 167).

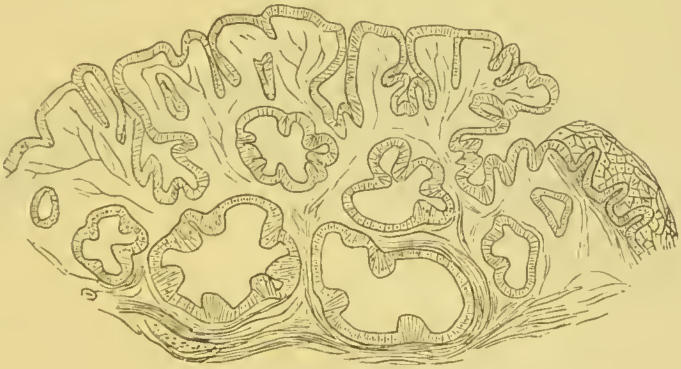

FIG. 167.
FOLLICULAR FORM OF EROSION (*Schroeder*).

The raw-looking surface is therefore a *newly-formed glandular secreting surface*, resembling in structure the cervical mucous membrane. This addition to the extent of secreting surface increases the leucorrhœal discharge which is the leading symptom.

In studying cervical catarrh we must not, however, limit our view to surface changes of epithelium, or else we shall simply fall into the error of those whose idea of it was limited by what they saw in the speculum. The whole substance of the cervix is affected by the inflammatory process, and it is possible that the epithelial changes are a mere accident, or at most a surface sign of a deeper lesion. According to Abel and Landau it is not of much importance whether the epithelium is squamous or cylindrical, and is present or absent; and the redness is due not so much to the thinness of the epithelium as to the congestion below. The changes seen in the speculum are significant as the signs of an inflammatory condition of the cervix, with which we also have frequently associated like changes in the uterus, in one word, chronic metritis. Pozzi, approaching the subject from a clinical standpoint, makes chronic metritis *the* lesion, of which the speculum changes are only one of many signs.

For this reason it is better not to apply any special name to these red patches, but to call them simply *catarrhal patches.*

The origin of this new epithelial structure is disputed. Ruge and Veit hold that the single layer of small cylindrical cells is produced by proliferation of the cells of the deepest layer of the rete Malpighi, while those of the superficial layer are shelled off (fig. 167). On the other hand, those red patches are generally continuous with the mucous membrane of the cervical canal, and resemble it in their microscopic structure; it is therefore much more probable that they are occasioned by proliferation of the *epithelium which lines the cervical glands*, leading to an extension of the glandular surface beyond the os externum.

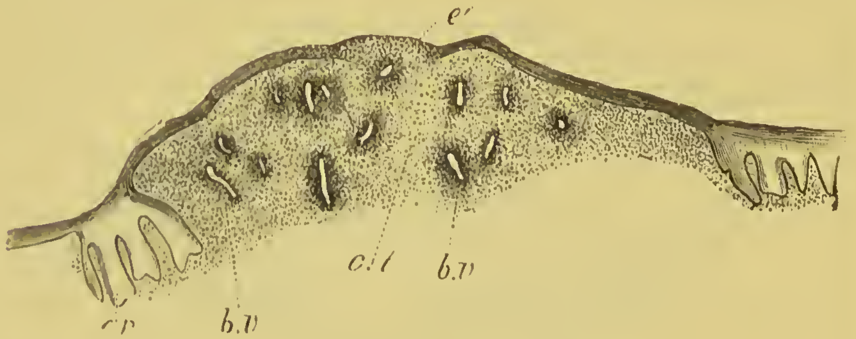

FIG. 168.

TRUE ULCERATION OF THE CERVIX. At the sides of diagram is seen the normal epithelium, which is prolonged in processes, *e p* between the connective tissue papillæ; *e* is superficial layer of squamous epithelium reduced to a thin layer at *e′*; *c t*, tissue of mucosa infiltrated with small cells; *b v*, blood-vessels surrounded by small-celled infiltration (*Fischel*).

The question as to the origin of the cylindrical epithelium found in erosions is rendered more difficult by the fact that the boundary line between the squamous epithelium outside of and the cylindrical within the cervical canal varies at different periods of development, and in different individuals.

The vagina is, as we have seen, originally lined with cylindrical epithelium, that is to say, the genital tract being formed of the ducts of Müller has the same epithelial lining throughout. Only at a subsequent period does the vagina come to have squamous epithelial lining, which may be derived from the Wolffian bulbs (p. 74). Whatever its origin, it extends upwards as a rule to the tip of the cervix where the os externum usually is found. Rarely does it fall short of this, in which case the vaginal aspect of cervix has the same rosy appearance as the lining of the canal. To this condition Fischel has applied the term congenital ectropium, since the appearance described resembles that called, later in life, ectropium, but the term is, we think, misleading. It is really a defective extension of the squamous epithelium upwards. More frequently a converse condition is present, the squamous epithelium extending within the cervical canal. This has been described in the child by Lott, and Landau and Abel; and Klotz makes one type of cervix in which in the adult squamous epithelium extends within the cervical canal.

True Ulcerations.

Sometimes a true ulcerative process—destruction of epithelium with inflammation of connective tissue—does occur; such a condition is represented in fig. 168.

Along with those changes in the mucous membrane, chronic inflammatory changes occur in the other tissues of the cervix. There is increased formation of connective tissue, which produces antero-posterior thickening and sometimes elongation. The secretion in the obstructed glands becomes inspissated, and hence the retention cysts are felt as firm pea-like bodies—ovula Nabothii—in the substance of the cervix or projecting from it; or their contents may suppurate and form small abscesses. As there are no racemose glands on the vaginal portion beyond the limits of the os externum (*see* Histology of Normal Cervix), these ovula Nabothii must be produced from the glands of the mucous membrane of the cervical canal or from the newly-formed glandular tissue. Fritsch draws attention to the fact that the glands of the cervix are enormously hypertrophied during pregnancy, so that the cervix becomes almost a glandular organ; the persistence of this condition after the puerperium, may explain the increased glandular formation which is described above as the chief pathological element in cervical catarrh.

Ovula Nabothii.

Cysts in the Cervix.

Sometimes we find a single large cyst in the cervix, due to obstruction of the mucous glands. When it is in the substance of the wall, the soft bulging into the cervical canal and the accompanying menorrhagia may lead one to suspect commencing sarcomatous infiltration. Puncturing with a trocar removes a clear or straw-coloured fluid, rich in mucous corpuscles.

The microscopic pathology of the cervix has only of recent years been carefully investigated, and there are many points on which definite information has not as yet been obtained. The following is a brief summary of the pathological changes described, which are best understood by comparison with the microscopic structure of the normal vaginal portion.

Normal and Pathological conditions of Cervix contrasted.

NORMAL CONDITION. The vaginal portion is covered on its vaginal surface with many layers of squamous epithelium, resting on papillæ of connective tissue; there are no mucous follicles. The cervical canal is lined with a *single layer* of *cubical* epithelium (ciliated only on the ridges), folded so as to form shallow recesses which do not branch; there are *racemose mucous glands*, which have branching ducts. The substance of the cervix is made up of *connective* tissue.

PATHOLOGICAL CHANGES. These, according to the extent and duration of the process, affect the three elements—epithelium, glands, connective tissue.

The *epithelium* of the cervical canal may be simply exposed (ectropium after laceration), or it may be inflamed. When inflamed, the folding of the mucous membrane is greatly increased so that the surface has a papillary or granular appearance. Further, this inflamed mucous surface may be found extending beyond its normal limit (the os externum) in the form of red patches (catarrhal patches) which are smooth or granular. These patches, though the most striking feature of the disease as seen in the speculum, are chiefly of significance as an index of a deeper lesion, just as a furred tongue is of a gastritis.

The *glands* hypertrophy and new glands form as the result of the proliferation of epithelium described above. The openings of the glands are at first restricted to the area covered with a single layer of cubical epithelium, but their branching ends extend below the limiting surface of stratified squamous epithelium. Their ducts become obstructed, and retention cysts form not only on the red patches but also underneath the adjacent, apparently normal, vaginal mucous membrane. They may remain as little nodules in the mucous membrane, or may come to the surface and burst; in the latter case, the cubical epithelium and papillæ on the inner wall of the cystic gland are exposed and, being now on a free surface, proliferate. When the glands are the special seat of the pathological changes, the whole substance of the cervix is converted into a cystic mass.

The *connective tissue* always increases in amount, specially when the process is chronic.

ETIOLOGY.

Frequency of Catarrh in Multiparæ.

The most important cause is, undoubtedly, the injury of the cervix produced in *parturition*; hence cervical catarrh is common in parous women. How this injury produces the inflammatory condition is a disputed point. Emmet refers it to the persistence of the split in the cervix and holds that the exposure of the mucous membrane to friction against the vaginal walls leads to irritation and inflammation; but we frequently see cases of well-marked lacerations without consequent cervical catarrh. It is admitted by all that the existence of lacerations greatly favours the development of catarrh.

Other less important causes are the *spread of inflammation* from the vagina *upwards* (vaginitis, which may be simple or gonorrhœal), and from the endometrium *downwards*. The latter is favoured by the fact that the discharges from the endometrium necessarily flow over the cervix and irritate it.

Cervical catarrh is the most frequent complication of retroflexion of the uterus. The flexion favours gaping of the lacerated cervix, and produces passive congestion of the cervical tissues.

SYMPTOMS.

These are—Leucorrhœa ;
Pain in back and loins, increased on exercise ;
Irregular menstruation ;
Sterility.

Leucorrhœa is the prominent symptom. Under normal conditions the secretion from the mucous membrane of the uterus and cervix is not sufficient to attract attention ; when it is excessive, it is termed leucorrhœa (λευκός white, ῥέω to flow) or in popular language, "whites." A transparent leucorrhœa from the cervix and uterus occurs before and after the menstrual flow ; this is a hyper-secretion due to temporary congestion.

Characters of Cervical Leucorrhœa.

The secretion from the glands of the cervical canal is clear and viscid, resembling unboiled white of egg. It becomes of an opaque white when mucous corpuscles are abundant, yellowish when pus corpuscles are present. Frequently, it is tinged with blood from the blood-vessels of the newly-formed vascular tissue.

Pain in the back and loins is present, as in all uterine disease. It is aggravated on active exercise, such as walking and riding, or whatever causes friction of the cervix against the vaginal walls.

Menstruation is irregular, and often increased in quantity ; this is probably due to extension of inflammation upwards to the endometrium. We must take care not to mistake leucorrhœa tinged with blood for the regular menstrual flow.

Sterility is often present. In nulliparæ with a small os externum, the plug of mucus in the cervical canal is alleged to be a bar to conception. In multiparæ, we have seen conception take place even though there was a deep laceration and well-marked catarrh ; the presence of catarrh, however, though not an obstacle to conception, diminishes its probability.

PHYSICAL SIGNS.

Condition of Cervix in Chronic Catarrh.

On *vaginal examination*, the condition of the cervix is found to vary according as the patient is nulliparous or multiparous and the disease of long or short duration. In a nullipara, the cervix feels puffy and large, the margins of the os soft and velvety (when there is eversion with extension of catarrhal area beyond the os externum) ; or the os and cervix are apparently normal but movement causes pain (when the catarrhal area does not extend beyond the os externum). In a multipara, the existence of a laceration must first be determined and the extent of it noted ; the margins of the os are soft and velvety, and pea-like nodules (Nabothian follicles) are felt on and sometimes round them ; polypoidal projections may be present and, more rarely, the cervix is converted into a mass of cysts ; the os is usually gaping so that the finger can be passed into the cervical canal, where the mucous membrane has an irregular surface and is often thrown into longitudinal ridges.

Appearance with Speculum of Cervix in Catarrh.

The *speculum* is now employed; its use must always be preceded by a careful examination with the finger to ascertain, when laceration is present, the undisturbed relations of the lips of the cervix. Neither finger nor speculum alone is sufficient, we must employ both, and learn to associate what is felt by the finger (*e.g.*, lacerations, velvety mucous membrane, pea-like follicles) with what is seen with the speculum. The superiority of the Sims' speculum for examination is very marked, as it exposes the lips of the cervix without disturbing the relations.

In a nullipara, we see the os apparently normal but with a tenacious plug of mucus projecting through it; or there may be red catarrhal areas such as are represented in Plate VIII., fig. 1, which shows very well the contrast between the appearance of these patches and the surrounding mucous membrane; no chromo-lithograph, however, perfectly displays the natural colours.

In a multipara, a laceration is sometimes evident. Oftener it escapes recognition; the os appears to be wide and unfissured, while on both lips there is a red velvety surface (Plate VIII., fig. 2); if now, tenacula be fixed in the gaping lips and those rolled in on one another, the red surfaces will disappear and a bilateral laceration become evident. Sometimes, white cicatricial tissue indicates the situation of the laceration. Though the lips are thus approximated, a red surface is often visible because the catarrhal area has spread beyond the os externum. The obstructed Nabothian follicles appear as bluish-red projections from the mucous membrane; occasionally they form small polypi.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

Diagnosis from Vaginal Leucorrhœa.

The diagnosis between cervical and vaginal catarrh is made clear by using the speculum, for we see in the former case the leucorrhœa coming from the cervix and having the characters above described.

From Endometritis.

The diagnosis between cervical catarrh and endometritis is difficult, and in many cases cannot be made; when cervical catarrh is present, we cannot be positive that there is not some endometritis as well. Increase in the length of the uterine cavity (with sometimes tenderness and irregularities of the mucosa), ascertained by the sound, indicates endometritis. When the cervix is much thickened and indurated, we may suspect the commencement of malignant disease; this will be considered under Carcinoma of the Cervix.

PROGNOSIS.

In this we must consider the constitutional health of the patient, the duration of the symptoms, and the extent to which the tissues are affected. The practitioner will often find that cases of cervical catarrh have already passed through several hands, and he should therefore be on his guard in offering hopes of speedy cure.

TREATMENT.

Constitutional Treatment important.

In the first place special attention must be given to the patient's *general health*; if we trust to local treatment alone, we shall often be disappointed. We should recommend change of air and light nourishing food. A certain amount of exercise is valuable; but too much of it, specially of riding, is injurious. Tonics (such as arsenic, quinine, and iron) are useful. Disturbances of the digestive system, which are frequent in chronic cases, must be treated as each case indicates. Complete rest from sexual activity is advisable; this can often be secured by recommending that the patient go away from home for a time.

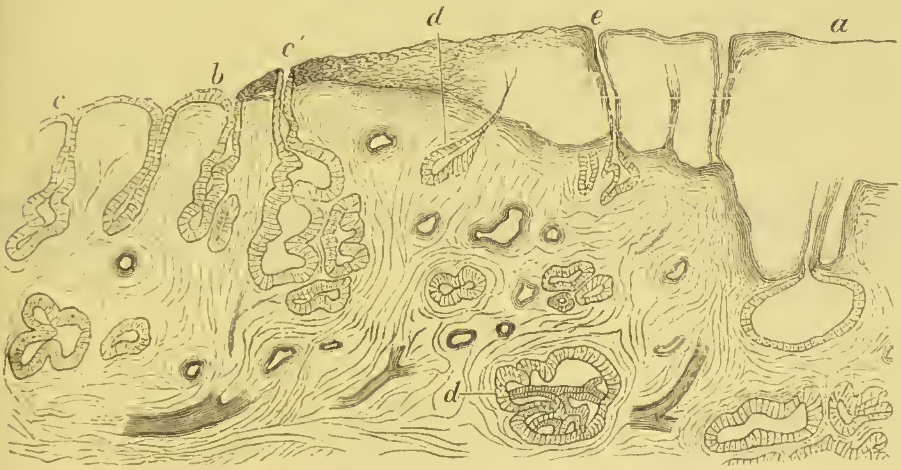

FIG. 169.

HEALING OF A CATARRHAL PATCH TREATED BY ASTRINGENT OR ANTISEPTIC INJECTIONS (*Hofmeier*). *a* to *b*, newly-formed squamous epithelium; from *c* to *c*′, is seen alteration of the epithelium at the mouths of the glands; *d*, *d*, glands with ducts obliterated; *e*, gland duct which has persisted.

Cervical catarrh is in some cases only a local manifestation of a constitutional state such as tuberculosis or anæmia.

The *local treatment* varies according as the patient is nulliparous or multiparous. In both cases we must be prepared to carry out a system of treatment which lasts for weeks.

Local Treatment in Nulliparæ.

1. In *nulliparæ* we begin with a course of vaginal injections of hot water. These are used freely, from ten minutes to a quarter of an hour, every night. To the simple water, astringents or antiseptics are added: sulphate of zinc (ʒj to the pint); sulphate of alumina or sulphate of copper (ʒij to the pint), or corrosive sublimate (1 to 4000).

The action of these on the catarrhal patches has been specially investigated by Hofmeier and Küstner. The former found that such a patch, treated by daily vaginal injections of pyroligneous acid, became gradually encroached on by the surrounding squamous epithelium's creeping in tongue-like processes over the cylindrical epithelium. The more superficial glands became filled up with the squamous epithelial cells; the deeper ones had their ducts narrowed or even plugged, while the gland-cavity persisted below (fig. 169). Küstner found that similar changes could be produced by ordinary antiseptic douches.

If the os be narrow, it is good to notch it bilaterally with the scissors. This acts beneficially by allowing the mucus to escape freely. Mundé recommends the trimming of the lips of the cervix so as to produce a funnel-shaped os.

When we find that the secretion continues copious in spite of the frequent injections, we must make a local application to the mucous membrane. Of applications the best are iodine (the tincture or the strong liniment) and carbolic acid, the former in milder and the latter in more severe cases. Iodised phenol, formalin, and the other applications to be described under the treatment of endometritis, may also be used. In making these applications we proceed as follows. The mucus, which would prevent the action of the medicament on the mucous membrane, is first thoroughly removed by the forceps dressed with cotton wool as represented at fig. 170. A second pair of forceps, covered merely with a film of cotton wadding, is now dipped into the medicament and applied to the surface. Should the canal be narrow, a sound dressed as for endometric applications (*see* fig. 178) is preferable. Care is taken that there be no free drop of the solution on the cotton wool, which might fall on the vaginal mucous membrane; after the application is made, a pledget of cotton wadding with glycerine is placed below the cervix.

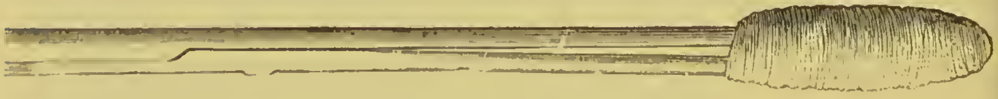

Fig. 170.

Forceps dressed with Cotton Wadding.

Rarely in nulliparæ is the pathological process so extensive as to require operative means for removing cervical tissue.

Local Treatment in Multiparæ.

2. In *multiparæ*. Here the cervical catarrh is usually associated with other conditions — retroflexion, subinvolution, and especially, marked laceration of the cervix. The first treatment indicated is to diminish the passive congestion of the cervix by hot-water injections with astringents or antiseptics, and the use of the glycerine plug. The latter is prepared as already described (p. 228). If the uterus be retroflexed, it

should be replaced and kept in position by a pessary. Even where it is not retroflexed, a pessary is often useful in lifting the uterus upwards in the pelvis and diminishing passive congestion. In cases where there is a distinct laceration of the cervix, and specially where the catarrhal patches can be made to disappear by rolling the lips inward on each other, Emmet's operation is indicated.

Depletion by Scarification or Leeches.

Local depletion by scarification is done best through the Fergusson speculum, and with a lancet-shaped bistoury; a number of small punctures are made from a quarter to half-an-inch in depth.

Scarification is also useful for another object. When there are hard knobby retention cysts producing irritation by the pressure of their contents, the puncture of these diminishes the chronic inflammation. Paquelin's cautery is also used to puncture the cervix; but this use of it belongs rather to the treatment of the hypertrophy of the Cervix in Chronic Metritis.

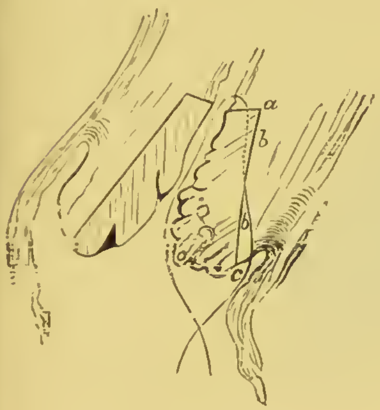

FIG. 171.

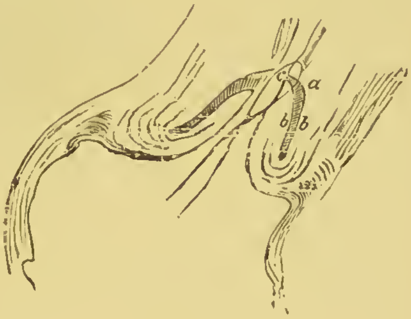

FIG. 172.

SCHROEDER'S EXCISION OF THE CERVICAL MUCOUS MEMBRANE in cervical catarrh. Fig. 171 LINE OF INCISION IN MUCOUS MEMBRANE. Fig. 172 MUCOUS MEMBRANE EXCISED and flap *bc* turned in on *ab* (*Schroeder*).

In very chronic cases, the only remedy is the destruction of the diseased glandular tissue—just as in tonsilitis we partially excise the tonsils.

Electricity has been used both in France and this country for the cauterisation of the cervical glands. An electrode with a rounded end (or a uterine-sound one, if it has to be passed up the canal) is connected with the negative pole of the battery, while the positive pole is placed on the surface of the skin. Several cases have been treated successfully by this method, but it is doubtful whether it possesses advantages over other forms of cauterisation to compensate for the difficulties in its use.

The curette may also be used for the removal of the diseased mucosa, but the only satisfactory method for doing this is excision with a knife. For this method of treatment we are indebted to Schroeder, who showed that Emmet's operation conceals the diseased mucosa without removing it.

Schroeder's Operation for Cervical Catarrh.

The steps in Schroeder's operations are as follows. The cervix is laid hold of with two volsellæ, one on each lip, and drawn downwards. It is divided laterally as far as the fornix with the scissors, so as to form an anterior and a posterior lip which are separate as far as the vaginal roof (fig. 171). A transverse incision (seen in section, at *a*, in fig. 171) is made across the base of the anterior lip, dividing the whole thickness of the cervical mucous membrane. The point of the lip is pierced at *c*, and the knife pushed in the direction *bb* till it reaches the cross incision *a*; the blade then is carried outwards first to one side and then to the other, so that all outside of the line *a b c* is cut away. The fla of cervix is now turned in, and stitched as in fig. 172. Schroeder in his first series of 350 cases had very good results as to the cure of catarrh, and recently Doléris,[1] in recommending the operation, refers to seventy-eight cases which have been followed through a subsequent confinement with satisfactory results. The operation not only favours fertility, but has no untoward result on the condition of the cervix in labour. He insists on the importance of excision of every portion of the diseased tissue, and the careful co-aptation of the raw surfaces with catgut sutures.

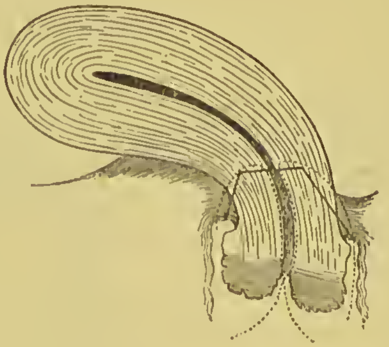

FIG. 173.

MARTIN'S METHOD OF EXCISING THE MUCOUS MEMBRANE OF THE CERVIX (*Martin*).

The continuous black line shows line of excision, which is higher up in the fornix than in fig. 154. The dotted line is the course of the suture introduced after the piece of the lip is excised.

Martin's Operation.

Martin in excising the diseased mucous membrane sometimes removes more of the substance of the cervix. As there is usually considerable hypertrophy of the cervix as well, the cervix is slit into an anterior and posterior lip, and a wedge-shaped portion cut out of each as described in the operation of amputation of the cervix. The incision in the cervical canal should extend higher up (fig. 173) than it does in ordinary amputation of the cervix (fig. 154) so as to remove the diseased mucosa.

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[1] *Loc. cit.*

CHAPTER XXXI.

ENDOMETRITIS.

LITERATURE.

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The endometrium differs functionally (as it does anatomically) from the cervical mucosa. While the latter is a secreting organ, the former has to produce a decidua in utero-gestation. As already said, the mucosa of the body of the uterus is not comparable to that of the stomach or lungs, and many of the morbid processes grouped under endometritis are more allied to new-formation than inflammation. This is specially true of those which are simple in origin, in contradistinction to those which are septic or specific. There is a growing tendency to regard those forms of endometritis, for example the glandular and fungous forms, as having the characters of a new formation rather than an inflammation.

There are, however, truly inflammatory conditions of the uterine mucosa, and the importance of the endometrium as the starting point of inflammatory conditions in and around the uterus has of recent years been emphasised. As the result of this, salpingitis and peritonitis are regarded as secondary lesions, the important condition being that of the endometrium. This change of view in operative Gynecology is interesting as seen in three ways. Intra-uterine treatment is being emphasised,[1] pelvic inflammation is regarded as an indication rather than a contra-indication for curetting,[2] and the more conservative treatment of the uterine appendages is advocated.[3]

We now consider inflammation of the mucous membrane of the uterus, although, from what we have said of extension of inflammation beyond the endometrium, we rarely find endometritis as a lesion by itself.

DEFINITION.—Inflammation of the mucous membrane of the uterus.

SYNONYMS.—Uterine catarrh, internal metritis.

PATHOLOGY.

In *acute endometritis* both body and cervix are involved, and usually the underlying muscular coat also. The mucous membrane is swollen and soft, and covered with red-stained mucus or creamy pus. Extravasations of blood are present as red streaks or patches. These changes are not so marked in the cervical mucous membrane as in that of the body; the vaginal portion has the same appearance as during pregnancy, being soft and swollen and showing red catarrhal patches round the os.

The ciliated epithelium is destroyed, and sometimes casts of the epithelium of the glands are found in the discharge (*Schroeder*). The secretion is at first mucous, then purulent.

In *chronic endometritis* the mucous membrane is hypertrophied and marked with patches of old extravasation.

Microscopic changes in Chronic Endometritis.

The microscopic appearances have only of recent years been worked at, and there is considerable difference of opinion both as to the changes produced and the significance of them. To understand these, we must keep in mind the two essential elements of the mucous membrane—the glands and the inter-glandular tissue; and also the view of Leopold, who considers the inter-glandular tissue as made up chiefly of lymphatics.

Ruge's three Varieties.

Accordingly, as the changes affect principally one or other of the two elements of the mucous membrane, Ruge finds a *glandular*, an *interstitial*, and a *mixed form*—the last being a combination of the first two.

In the *glandular*, a marked growth and increase of the glandular epithelium occurs. The gland-ducts hypertrophy (Pl. IX., fig. 3), and through multiplication the epithelium may form bulgings into their lumina, making them saw-like instead of tubular in section, or the wall may be thrown into folds (*cf.* appearance of normal glands Pl. IX., fig. 1 with Pl. IX., fig. 3). In addition to hypertrophy there may be hyperplasia (Pl. IX., fig. 4), the glands increasing in number either through lateral branching or the ingrowth of new ones from the surface. In the *interstitial* (Pl. IX., fig. 2), the stroma is affected—in recent cases its cells, in more chronic the intercellular substance. In the recent cases there are abundance of small cells (like nuclei only, from the small quantity of their protoplasm), which, if recovery does not take place, pass into spindle-cells arranged in interlacing bands; sometimes they swell up and take on a decidual character—the nuclei becoming larger and containing nucleoli. In the chronic cases, the intercellular substance is thickened by exudation and its fibres increased and thickened.

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[1] As in Mackenrodt's paper. Beitrag zur intra-uterinen Therapie: Sam. Klin. IV. N. F. No. 45,

[2] Mackenrodt—Loc. cit.; also Piqué—Gaz. des Hôpitaux. 1891, No. 19.

[3] Polk—New York Jour. of Gyn. and Obstet., Feb. 1892.

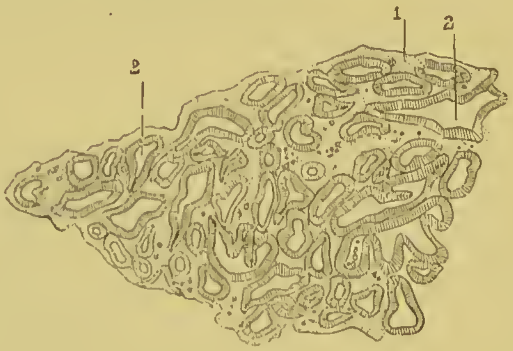

FIG. 174.

GLANDULAR TYPE OF ENDOMETRITIS (*De Sinéty*). 1. Stroma; 2. Dilated glands. ($\frac{40}{1}$).

In endometritis after abortion, small islands of decidual cells (which have not undergone retrograde changes as rapidly as the rest of the decidua) are sometimes found with small-celled proliferation going on round them (Pl. IX., fig. 5).

Olshausen's Endometritis.

A special form of endometritis was carefully described by Olshausen under the name of *E. fungosa*. In it the mucous membrane is hypertrophied to three or four times its normal thickness. It is elevated through its whole extent in a soft cushion-like swelling, or in more localised spongy masses; the hypertrophy does not extend beyond the os internum to the cervix, and thus resembles in its situation a decidual membrane. The portions removed by the curette are unusually thick; one side presents a smooth rose-coloured surface which resembles the appearance of the mucous membrane of the intestine, and the other has a deep-red raw surface. "The microscopic examination of these scrapings," Olshausen says, "shows that there is great hypertrophy of the mucous membrane with increase of all its elements — moderate dilatation of the lumina of the glands, enlargement of the blood-vessels, and marked cellular infiltration of the connective tissue." The

PLATE IX.

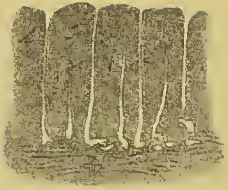

FIG. 1.

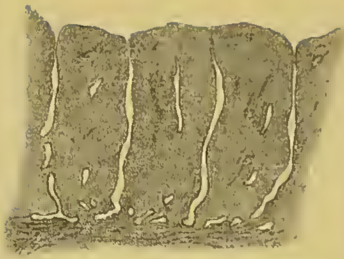

FIG. 2.

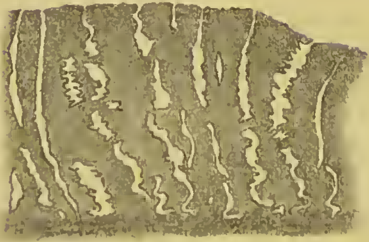

FIG. 3.

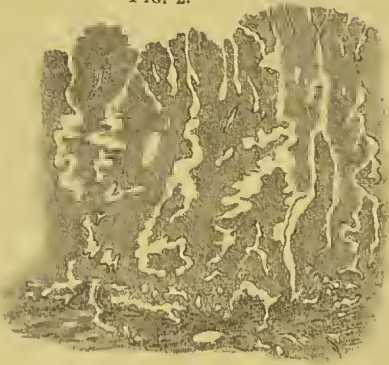

FIG. 4.

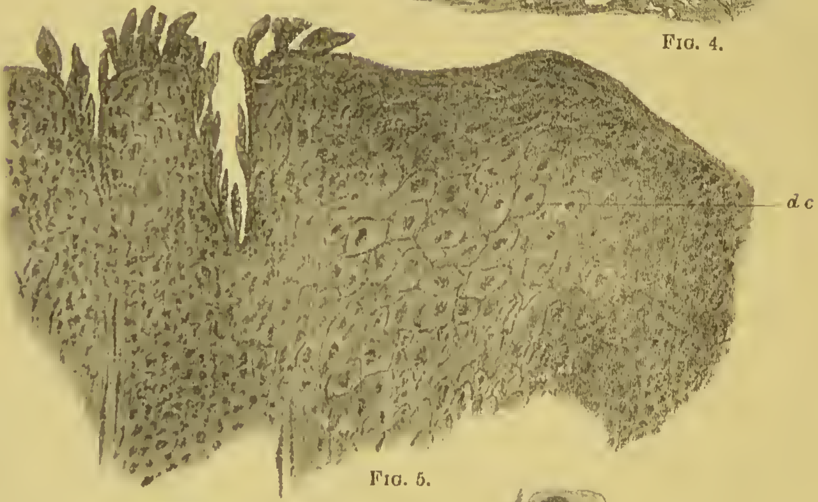

FIG. 5.

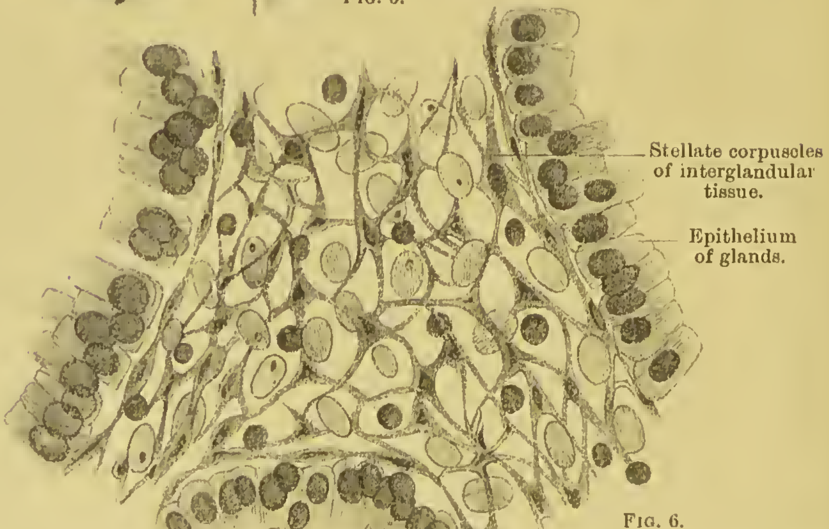

FIG. 6.

W & A.K. Johnston, Limited, Edinburgh & London

MUCOUS MEMBRANE OF UTERUS IN ENDOMETRITIS
(FIGS. 1—5, *Ruge;* FIG. 6, *Heinricius*).

FIG. 1. Normal Mucous Membrane, FIG. 2. Interstitial Endometritis,
FIG. 3. Glandular hypertrophic E., FIG. 4. Glandular hyperplastic E. (all magnified ten times).
FIG. 5. Endometritis after abortion showing group of decidual cells *d c*
FIG. 6. From E. fungosa showing nature of changes in interglandular tissue

characteristics of this type are, that the glands do not become enlarged so as to produce cystic dilatations, and that the blood-vessels are distended; the latter fact explains the hæmorrhage which is the chief symptom. The small-celled infiltration is shown in the sections given in figs. 175, 176.

In some cases of endometritis fungosa, Zeller found that portions of the exfoliated mucous membrane consisted of squamous epithelium arranged in several layers—a sort of psoriasis uterina.

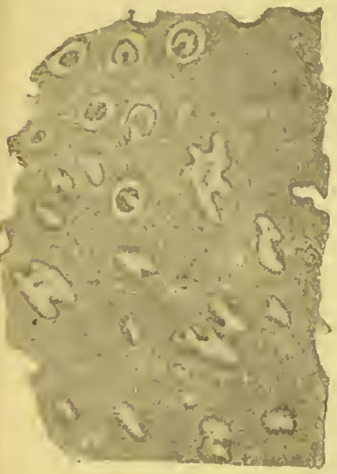

FIG. 175.

SECTION OF ENDOMETRITIS FUNGOSA—Low power; showing changes, chiefly interstitial (from a microphotograph).

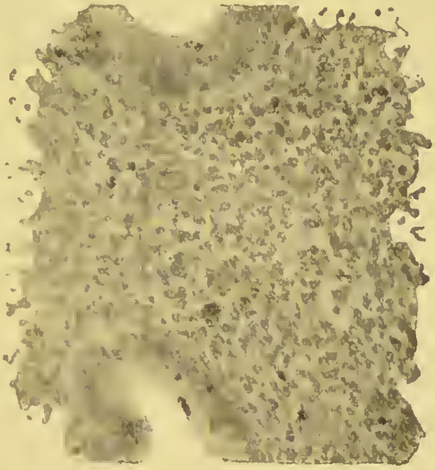

FIG. 176.

SAME—High power, to show the small-celled infiltration of the connective tissue.

Heinricius view of Endometritis. Fungosa.

Heinricius has described the scrapings taken from a large number of cases of fungous endometritis. A thin section with sparing infiltration gives under a high power[1] the appearance seen in Pl. IX., fig. 6. The stroma between the glands (the epithelium of which is seen in the corners of the section) consists of a basis of stellate corpuscles with anastomosing processes, upon and between which lie two varieties of cells—large, oval, faintly-stained ones, and others, small, round, and deeply stained, the former being the nuclei of an endothelium, the latter lymph corpuscles. He thus agrees with Leopold that the interstitial tissue consists largely of lymph sinuses. When inflammation occurs, the lymph corpuscles and those of the endothelium proliferate and produce an appearance resembling a "small celled infiltration," for the basal network is obscured by them. He thus comes round to practically the same condition as Olshausen has described, but assigns a different position to the small cells.

Landau and Abel[2] deny the existence of a hyperplastic glandular form of Endometritis and would recognise only the *E. fungosa*, making the cases of hypertrophied glands a localised *Adenoma simplex*. Their argument is that the changes in any inflammation are primarily in the interglandular tissue, the changes in the epithelium of the glands being so to speak accidental and the result of the hyperæmia. The "cork-screw-like hypertrophy" is a normal condition. Where the glands actually grow, it is an *Adenoma*. Further, as to the interglandular changes, the decidual cells described by Ruge are not peculiar to the uterus, but simply the large epitheloid cells (fibro-blasts) which are an intermediate stage in the formation of connective tissue from inflammatory products in any situation.

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[1] Zeiss, Ocular 3, Water immersion K.

[2] Beitrage zur pathologischen Anatomie des Endometrium: Archiv. f. Gyn., XXXIV., S. 165.

Cornil, who has also described the changes in the mucous membrane in endometritis, maintains that it is a true inflammatory process from the excess of mucus, the multiplication of the epithelium, and the migration of leucocytes. In the gland-cells, karyokinesis is often seen.

Ultimate changes in Endometritis.

When chronic endometritis has persisted for a long time, the mucous membrane becomes atrophied; the ciliated and afterwards the cylindrical epithelium is lost, and small polymorphous cells resembling squamous epithelium take their place; finally, the mucous membrane disappears altogether and the uterine cavity comes to be lined with a layer of connective tissue. The glands fall out so that the mucous membrane becomes mesh-like, or they are constricted to form retention cysts.

Senile Endometritis.

Senile atresia of the cervical canal is the result of a localised chronic endometritis. This is one of the physiological changes which occur after the menopause. In some cases, however, it becomes pathological; accumulation of mucus, more rarely of blood, takes place above the obstruction.

Relation of Micro-organisms to Endometritis.

Looking at endometritis from a bacteriological standpoint, Winckel,[1] has classified the various forms in two groups, according as they are due to micro-organisms or not. In the latter group he places (1) simple catarrh due to disturbance of circulation, as in chlorosis, uterine displacement, faults in dress, mode of life, etc.; (2) hæmorrhagic endometritis, as in acute and infectious diseases; (3) decidual endometritis, after abortion; and (4) exfoliative endometritis. In the former group he places (5) gonorrhœal endometritis; (6) tuberculous endometritis; (7) puerperal septic endometritis, usually due to the streptococcus longus, more rarely to a staphylococcus or to the bacterium coli commune; (8) saprophytic endometritis due to combinations of cocci and bacilli, of which the senile purulent endometritis is probably one form; (9) the so-called diphtheritic endometritis which is due to streptococci; (10) syphilitic endometritis—the cervical mucous membrane exposed by laceration being a favourable nidus, but infection of the decidua the more important cause; (11) endometritis due to amœbæ—protoplasmic bodies with nuclei and vacuoles being present in the dilated uterine glands, and causing proliferation of epithelium.

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[1] Centralb. f. Gyn. 1895, S. 695.

This classification raises the question as to the part played by micro-organisms, which can only be answered by observations made directly on the endometrium. Bumm,[1] from the examination of the secretions of forty-five cases of endometritis, concludes that the micro-organisms found in some cases of endometritis are accidental, and that neither the hyperplastic nor catarrhal varieties are dependent on them for their development. On the other hand, endometritis may follow an acute septic or gonorrhœal infection.

Gottschalk and Immerwahr[2] have examined the secretions from sixty cases, and found that in twenty-one, that is in 34·5°/₀, no micro-organisms were present; of the remaining thirty-nine, twenty-eight showed non-pathogenic micro-organisms (mostly diplococci), while eleven showed staphylococci. The results of these observers thus agree with those of Pfannenstiel and Döderlein.

We must also remember that even the presence of micro-organisms does not prove their activity. It is not enough to find them; the question is whether they can grow, that is to say, under what conditions they are hurtful or harmless. In a very interesting paper on the flora of the female genital tract in health and disease,[3] Menge has maintained that the secretions of the cervical canal destroy bacteria, and that the vagina aids the cervix in its endeavour, so to speak, to keep the upper portion of the genital tract free from germs. He concludes that in the normal endometrium of body and cervix and their secretions, and even in chronic hypertrophied conditions of the mucosa, with or without small-celled infiltration, germs are not present, with the exception of the gonococcus, which even healthy tissues are unable to resist. Staphylococci and streptococci if present during an acute endometritis, disappear in a chronic stage. It is possible, however, that these latter may have a share in the etiology of endometritis through persistent anatomical changes in the endometrium, excited by them during the acute stage. He associates the presence of bacteria with these four conditions: gonorrhœal endometritis (gonococcus); tuberculous endometritis (tubercle bacillus); acute endometritis (streptococci, staphylococci, sapræmic bacteria, bacterium coli commune); septic collections in the uterus, as retained placental products, or after enucleation of polypi.

While evidence is thus accumulating that micro-organisms do not play so important a rôle in the etiology of endometritis as Doléris and others have held, it does not follow that we must relax our antisepsis in its treatment. On the contrary, the greatest antiseptic precautions must always be used lest we introduce micro-organisms which were not there before. Unless the external genitals and vagina be thoroughly cleansed, and aseptic instruments be used, a purulent endometritis may be induced on a simple one. For the same reason, forcible dilatation should not lightly be had recourse to, and all forms of treatment should be avoided which imply repetition in their use. Another practical deduction is that removal of the mucosa by the curette is not called for in all cases of endometritis; and to draw a picture of a germ-laden mucosa being thus removed in order that a healthy one may grow under our antiseptic precautions, is to push the germ theory too far.

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[1] Centralb. f. Gyn. 1895, S. 698.
[2] Archiv f. Gyn., 1896, Bd. L., Heft 3.
[3] Centralb. f. Gyn., 1895, S. 795.

ETIOLOGY.

Acute endometritis is a rare condition, and never occurs before puberty. It comes on most frequently in connection with menstruation, when the physiological congestion readily passes into inflammation. It is occasioned by exposure to cold at the periods, and by the extension of gonorrhœal inflammation from the mucous membrane of the vagina. It also occurs in the exanthemata,[1] typhus, scarlet fever, and measles; it has further been observed in cholera (*Slavjansky*), and in certain cases of phosphorus poisoning. In puerperal inflammation, endometritis is of course present.

Causes of Chronic Endometritis.

Chronic endometritis is occasionally the result of acute; most frequently, however, it arises independently. Sometimes it is merely the indication of the constitutional state; in scrofulous and chlorotic cases, the normal leucorrhœa (which precedes and follows menstruation) is increased in quantity and prolonged during the intermenstrual period. This is due to hypersection rather than to inflammation. Increased leucorrhœa, with diminished menstrual flow, is common in phthisis.

Chronic endometritis arises independently from the following causes:—

Parturition, specially when the uterus has not been completely emptied;
Exposure to cold during menstruation;
Polypi or other tumours in the uterine cavity;
Some uterine displacement, *e.g.*, prolapse;
Direct injury through incautious use of sound or tent;
Extension of gonorrhœal or simple inflammation from vagina and cervix;

It has also been found after non-physiological amenorrhœa.

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[1] Massein found acute inflammatory changes in twelve cases of typhus, pneumonia, and dysentery: "Archiv f. Gyn.," Bd. XL., Hft. 1, S. 146.

Of these the most important is *parturition.* Endometritis is frequent after abortion; usually this is due to the patient's rising too soon, or to the incomplete emptying of the uterus. Küstner has traced the transition of a portion of decidua, retained after abortion, into a tissue having the structure of a mucous polypus. As to the frequency of this occurrence, he says that, of 112 cases of endometritis, nine were cases of decidual endometritis (Pl. IX., fig. 5). After full-time labour, the seat of the placenta seems to be in many cases the starting-point of the inflammatory process.

Uterine displacements do not necessarily produce endometritis. We sometimes find a retroversion or retroflexion which has produced no symptoms. As a rule, chronic inflammation of the endometrium, as well as of the muscular coat, follows passive congestion.

Brennecke[1] and Heinricius[2] have drawn attention to the occurrence of endometritis following non-physiological amenorrhœa. After irregular menstruation (at longer or shorter intervals), or complete amenorrhœa, profuse bleeding takes place from the uterus. It is most common in patients towards the menopause, but has also occurred in anæmic or poorly nourished girls. They ascribe it to lowered activity of the ovaries so that the hyperæmia at the menstrual period leads only to hyperplasia of the uterine mucous membrane, not to hæmorrhage; hence the mucous membrane becomes hyperplastic, and when hæmorrhage does return it is profuse.

SYMPTOMS.

A. *Of Acute Endometritis.*

These are fever more or less severe, according to the inflammation, pain in the back and lower part of the abdomen with the sensation of weight in the pelvis, and in severe cases vesical and rectal tenesmus. The characteristic symptom is the discharge, which is at first clear and watery, but after a few days becomes creamy and purulent. The menstrual flow is sometimes suppressed, rarely it is increased.

B. *Of Chronic Endometritis.*

The symptoms usually given are the following:—

Menorrhagia;
Leucorrhœa;
Dysmenorrhœa;
Weakness in the back;
Pain in pelvis and loins;
Digestive derangements;
Sterility;
Abortion.

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[1] Archiv f. Gyn., XX., S. 455.

[2] Op. cit.

Menorrhagia is the characteristic symptom, and may become serious from the anæmia which it produces. It shows itself first in increased duration of the menstrual flow, which becomes gradually prolonged over the intermenstrual period till the loss of blood becomes continuous. *Dysmenorrhœa* is frequently present, but it is more probably due to complications (*e.g.*, cellulitis or chronic metritis) than to the condition of the mucous membrane. Membranous dysmenorrhœa (accompanied with exfoliation of the mucous membrane at the menstrual period) might be considered here, as its pathology is most nearly allied to endometritis; from its peculiar symptoms, however, it is better to consider it in the chapter on Dysmenorrhœa (Section VIII.).

Leucorrhœa[1] is a frequent symptom. The secretion from the body of the uterus is of a watery character, less dense and gelatinous than that from the cervix; usually, however, there is cervical catarrh as well. The uterine secretion has an alkaline reaction, while vaginal leucorrhœa is acid. Sometimes it is tinged with blood, producing an appearance which Bennet compared to the rust-coloured sputum in pneumonia. The blood stained leucorrhœa must not be confounded with the menstrual flow. In some cases the discharge is purulent, accumulates in the uterine cavity, and is only discharged at intervals. This occurs in the senile form, in which cases also the discharge may be fœtid,[2] simulating malignant disease (*v.* p. 345).

"*Weakness in the back*" is the common complaint made by the patient. It may amount to actual pain, but more generally it shows itself as feebleness or weariness which incapacitates the patient for her daily work.

Derangements of the digestive and nervous systems invariably follow when the disease has become chronic. There is impaired digestion with loss of appetite, and, as the result, general debility. Whether these are due to the drain on the system produced by the leucorrhœa or to the close connection between the nervous centres for the sexual organs and those for the digestive apparatus, we do not know. Derangements of the nervous system show themselves in frontal headache and depression of spirits amounting sometimes to melancholia.

Anæmia, with its characteristic train of symptoms, is the leading symptom in the hæmorrhagic type (*Olshausen*).

Sterility is frequently present, and has been in certain cases the only symptom complained of. The secretion may destroy spermatozoa, may mechanically prevent them from passing upwards, or the villi of the fertilised ovum may be prevented from finding an attachment in the diseased mucous membrane. Again, the ovum is attached for a time, but from the imperfect formation of the uterine portion of the placenta, *abortion* takes place; repeated abortion occurs in chronic endometritis. A vicious circle is thus produced: as mentioned under etiology, endometritis frequently follows abortion; abortion, in its turn, frequently follows endometritis.

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[1] We mention this as a symptom usually given, although proof is wanted that the secretion from the *uterine* mucosa is increased in Endometritis—it may be entirely cervical.

[2] Croom, Sir Halliday: "Senile Uterine Catarrh," Edin. Obst. Trans., 1897.

PHYSICAL SIGNS.

A. *Of Acute Endometritis.*

There is tenderness on pressure over the lower part of the abdomen due to peritonitis which generally accompanies the acute form. On vaginal examination the cervix is found to be swollen and puffy, the os is dilated and feels velvety from eversion of the mucous membrane, the bimanual is unsatisfactory on account of the tenderness. The speculum shows the vaginal portion to be congested, with catarrhal patches round the os and the follicles enlarged and sometimes containing pus. The leucorrhœal discharge already described is seen coming from the os uteri. The sound should not be used, as its introduction causes pain and sometimes hæmorrhage.

B. *Of Chronic Endometritis.*

Tenderness on pressure is not necessarily present, though we frequently find it as the result of complications—peritonitis, cellulitis, ovaritis.

On vaginal examination the vaginal portion of the cervix is normal, or has the characters described under cervical catarrh. The bimanual shows the uterus to be *enlarged*; and often of firm consistence from chronic metritis.

The sound passes *beyond* the $2\frac{1}{2}$ inch knob to a varying extent, and on withdrawal is frequently tinged with blood. Its introduction may be difficult from irregularities in the mucous membrane, and is sometimes painful. It is most useful in demonstrating *irregularities of the mucous membrane*, and their recognition is of great importance: to detect these, the sound is held lightly between the finger and thumb and moved slowly backwards and forwards over the mucous membrane; a grating or catching sensation is felt when they are present. We must note, however, as Olshausen points out, that the spongy irregularities may escape detection by the sound.

With the speculum we see, issuing from the os, the leucorrhœal discharge with the characteristics given above; usually it is mixed with that from the cervix. The appearance described under cervical catarrh are also frequently present.

DIAGNOSIS: DIFFERENTIAL DIAGNOSIS.

Value of Microscope in Diagnosis.

The curette is invaluable in diagnosis, especially when its use is followed by *microscopical examination* of the scrapings—the importance of which here cannot be overrated.

This throws light on the etiological question, whether the endometritis be due to incomplete emptying of the uterus after *parturition*. In such a case we find among the scrapings large decidual cells or fragments of the villi of the chorion in a state of fatty degeneration.

It enables us to differentiate endometritis from commencing malignant disease—*adeno-carcinoma* and *sarcoma*. In adeno-carcinoma we see under the microscope a great proliferation of the glandular epithelium. The glands are increased in number, have lost their regular outline and are lined with two or three layers of cells, while here and there large masses of epithelial cells are seen without any attempt at glandular formation proliferating and penetrating into the surrounding stroma. The cells often contain karyokinetic figures. In glandular endometritis (fig. 174) the glands, though increased in numbers, retain their regular outline and the cells do not show any tendency to proliferate in masses into the stroma. In many cases, however, the diagnosis, from a microscopical examination alone, is not easy, especially if no large pieces of tissue have been removed by the curette.

In sarcoma we see under the microscope the typical round or spindle-shaped cells. The hæmorrhagic type of endometritis may readily be mistaken for sarcoma uteri, because "it spreads in a diffuse manner, pre-eminently causes hæmorrhage, produces pain not at all or only late" (*Olshausen*). The microscope, however, settles the diagnosis. Care must be taken not to mistake the small-celled infiltration of the tissue (fig. 176) for round-celled sarcoma. The cells of the latter are characterised by their larger size and oval nuclei.

PROGNOSIS.

Endometritis is not a fatal disease in itself, though, when long protracted, it seriously affects the constitution and produces permanent ill-health. In cases of excessive hæmorrhage, the condition becomes grave.

The treatment is often protracted, and the patient should always be warned of this. The occurrence of conception will produce the most favourable conditions; and, if due care be taken to prevent abortion in the early months, and in the management of the puerperium, we may hope for a cure.

When endometritis is associated with a strumous, tuberculous, or syphilitic diathesis, it may baffle all our efforts.

TREATMENT.

A. Of Acute Endometritis.

Treatment of Acute Endometritis.

Rest in bed, warm fomentations over the abdomen, and the free use of opium if there is much pain, form all the treatment required. Should the bowels not be moved freely before the attack, castor oil with an enema should be given since the loaded rectum presses injuriously on the inflamed uterus. Should the bowels not be loaded, the patient is not to be troubled with purgatives but rather kept under the influence of opium. If there is menorrhagia, ergot is required; when the discharge is free, it is to be given hypodermically. The vaginal douche, if used, should be as hot as the patient can bear.

B. Of Chronic Endometritis.

Of Chronic Endometritis.

Prophylactic treatment is of great importance. A patient who is subject to endometritis should guard against exposure during the menstrual period. When conception takes place, the practitioner should remember the liability to abortion, the importance of seeing that the uterus be thoroughly emptied after parturition, and that the patient take proper care during the puerperium; during the latter period, ergot is beneficial.

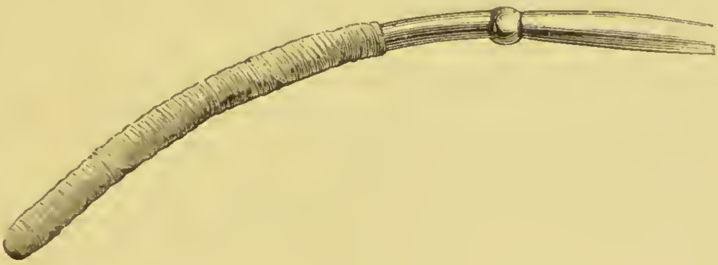

Fig. 177.

Sound Dressed with Wadding for Applications to Endometrium.

We begin with hot-water injections, and the administration of ergot; this is given as the liquid extract (twenty drops in water three times a day, increased to thirty at the menstrual period) or ergotin—four grains in pill, daily.

Curetting of Uterus.

If the uterine cavity be enlarged so that the sound moves freely within it, if there be roughness of the endometrium, or if there has been a recent miscarriage or confinement, we employ the *curette followed by the application of carbolic acid* or other medicament. In the last class of cases the cause of the endometritis has been the incomplete separation of the decidua; if treated while still recent, such cases furnish the most satisfactory instances of an immediate and complete cure.

The fixing of the uterus by adhesions or cicatrisation does not contra-indicate the operation, though these render it more difficult through preventing the uterus from being drawn down by the volsella; when they are present, undue traction must not be made. The time selected for operation is a week after a menstrual period; when the discharge is continuous, the period is indicated by increase in amount.

Curetting of the Uterus followed by Intra-uterine Medication. The following instruments are necessary:—

Sims' speculum,
Three or four sounds dressed with cotton wool,
Volsella,
Curette,
Pure carbolic acid or other application,
Iodoform gauze,
Vaginal and intra-uterine douche.

Though chloroform is not necessary, its use makes the operative manipulation much easier, and allows it to be done more thoroughly.

The sounds should be covered with a thin layer of cotton wool, extending almost to the knob (fig. 177). The sound is dressed as follows:—A film of cotton wadding is laid on the palm of the left hand, the last two and a half inches of the sound are moistened and pressed firmly on the cotton wadding, the left hand is closed over it, the sound is turned twice or thrice round within the shut hand till the cotton wadding becomes tightly rolled on. The dressing must bite the sound firmly so that it may not come off within the uterine cavity, and must not be so thick as to present it being easily carried in. To remove the cotton wadding afterwards, the dressing is unrolled under water. Of the various applications in use we recommend pure carbolic acid or iodised phenol—a saturated solution of carbolic acid in tincture of iodine. Tincture of iodine, strong nitric acid or formalin (*v.* p. 344) may be substituted for these.

Operation of Curetting.

The patient is placed in the lithotomy posture; Sims' speculum is passed and held by an assistant—if there be no assistant some form of self-retaining speculum is used; the vagina is washed out with an antiseptic, and the cervix fixed with a volsella. The curette shown at fig. 90 is the best. The uterine wall is scraped from side to side and from above downwards, special care being taken to remove the tissue from the Fallopian-tube angles and the sides of the cavity. The detached fragments are brought down with a raking motion or washed out with an intra-uterine douche through a Fritsch's catheter. A sound, dressed with dry cotton wadding, is passed to clear away the blood and mucus; the same process is immediately repeated with a second, and with a third if necessary. A reserve sound, previously dipped in the carbolic acid so as to be ready for use, is carried in immediately after the last of these has been withdrawn; if there is much bleeding or the uterine cavity is large, a second application should be made; our aim is to apply the carbolic acid to the whole of the raw surface, without its being diluted with blood or mucus. A narrow slip of iodoform gauze is carried into the uterus by means of dressing forceps to act as a drain, and more gauze packed into the vagina below. The gauze should be in a continuous strip for ease in removal.

The plug is removed in twenty-four hours and a vaginal douche given. The patient stays in bed for a week or ten days and has a vaginal douche night and morning.

Curetting for Tubal Inflammation.

Curetting, and especially curetting followed by packing the uterus with gauze so as to ensure drainage, has recently been advocated on account of its secondary influence on the condition of the Fallopian tubes. Whether it does this by promoting drainage from the tube, or by an osmosis as Polk suggests, or simply by cutting off a source of infection from the endometrium, we cannot say; but undoubtedly certain tubal conditions are benefitted by it. Though we have not yet data for laying down rules, it is evident that discrimination between cases is necessary. For example, while curetting would benefit a catarrhal salpingitis, the operative manipulation which it implies might be disastrous in a pyosalpinx. Curetting is now also advocated in conditions where some years ago it was tabooed. Chronic peritonitis and cellulitis, which were before considered as contra-indications, are now in certain cases regarded as a reason for removing the source of infection from the uterus which keeps up the inflammatory condition.

Regeneration of Mucous Membrane after Curetting.

The regeneration of the uterine mucosa after curetting has been studied by Werth,[1] in uteri removed by extirpation which had been previously curetted. The uterine mucosa is apparently reproduced much more rapidly than one would expect (within five days), and not by the process (formation of granulation tissue) which occurs after, say, the scraping of an ulcer on the skin, but by a process apparently peculiar to the uterine mucosa.

He examined six uteri that were extirpated after the operation of curetting at periods varying from three to sixteen days. In two of them extirpation had not been resolved on when curetting was done, but became necessary later; in the other four the curetting was done as a preliminary when the patient was being examined some days previous to the extirpation. The microscopic examination showed that the action of the curette varies in different parts of the same uterus, the mucosa being untouched in places (usually at the fundus and in the angles), while in others it is removed down to the muscular wall. It is the mucosa over the anterior wall rather than the posterior, and low down rather than high up in the uterus, that is most thoroughly removed. The uterus five days after curetting shows the regeneration changes most evidently. The interior of the uterus is entirely clothed with the new mucosa, with glands opening freely on the surface, and an unbroken covering of surface-epithelium. This new mucosa is characterised by its richness in fibrillar connective tissue as against cellular elements. The vessels play the chief part in its construction. They extend outwards, carrying with them a mantle of fibrillar connective tissue which follows the division of the vessels, and forms a network of new tissue. The glandular element arises from the fundi of the uterine glands which, embedded in the muscular coat, have escaped the curette. From these grow upwards new glands amongst the fibrillar tissue, usually straight and vertical. The cells are at first shorter towards the surface, and longer towards the bottom of the glands. The connective tissue often grows more rapidly, so that the glands come to open in pits on the surface. Its more rapid growth causes division of the glands, so that they open with more than one orifice, and also the irregularity of the surface of the mucosa. The surface epithelium is formed essentially from the glands, although the cells also multiply on the surface by division. New surface epithelium is found three days after curetting. In the later stages of the mucous membrane regeneration the excess of fibrillar connective tissue is removed by a hyaline degeneration which is apparent even five days after curetting, in the sub-epithelial layer. By the tenth day only a few bundles remain here, their place having been taken by large cells, mostly fusiform, with numerous protoplasmic processes. When the curette has injured the muscular wall the loss of tissue is evident even seventeen days after, being marked by a layer of necrosed muscle and connective tissue covered by fibrin. Into this extend wide vessels surrounded by round cells, recalling the usual appearance of granulation tissue.

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[1] Archiv f. Gynäk., Bd. XLIX., Hft. 3, S. 369. Baldy (op. cit., p. 231) also figures a uterus three months after curettage; and sections of the mucosa thirteen days after it.

Endometritic Applications.

Applications without a previous curetting may be made in cases where there is no history of recent parturition or where the symptoms (menorrhagia) are slight. In all other cases the preliminary use of the curette is a distinct advantage, as it removes the fungosities and thus allows the caustic to act more efficiently. Iodised phenol is a very useful and safe application. Formalin introduced by *v.* Winckel,[1] has been strongly recommended by Menge,[2] on account of its germicidal properties unaccompanied by any danger from absorption. He uses it as a 30 per cent. aqueous solution, applied on a dressed probe.

Cauterisation of the mucosa by steam,[3] a method introduced by Sneguireff, has been found useful especially in checking hæmorrhage. The apparatus consists of a kettle for generating the steam and a double catheter for conveying the vapour into and out of the uterus. Perforations on the intra-uterine part of the tube allow the vapour to escape and cauterise the mucosa.

Electricity has been used in endometritis as in other chronic inflammations; this will be considered when the whole subject of Electricity in Gynecology is dealt with in the Appendix.

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[1] Ueber den Gebrauch und die Wirkung des Formalin, etc.: Festschrift zur Feier des Jubiläums der Berl. Gesell., 1894.

[2] Die Therapie der chronischen Endometritis, etc.: Arch. f. Gyn., 1901, S. 344.

[3] A. R. Simpson—Vaporisation (Atmokausis) of the endometrium: *Scot. Med.* and *Surg. Journ.*, 1900, p. 499. He records fourteen cases with satisfactory results. Schultius (*Wien. Med. Presse*, Oct. 1899) gives the depth of mucosa affected according to the temperature of the steam and length of application, with his experience of fifty cases; and Abram Brothers (*Amer. Journ. of Obst.*, 1899, p. 498) refers to forty-four cases with good results for hæmorrhage but not for leucorrhœa.

Czempin (*Cent. f. Gyn.*, 1896, No. 2) found in a uterus removed by hysterectomy two months subsequently that the mucosa had been entirely destroyed by the cauterisation. Blacker (*Jour. of Obst.* and *Gyn. of the British Empire*, vol. iii., p. 444) found the same fourteen days after the cauterisation. Pincus (*Zent. f. Gyn*,, 1901, pp. 394, 964 *Samm. Klin. Vorträge*, N. F. 238, 261, 262.) gives the literature of Atmokausis up to date, and recommends it strongly not only as checking hæmorrhage but as reducing the size of the uterus. He contrasts it with Zestokausis, in which an instrument is used similar to Paquelin's cautery, but protected by tubing so as to limit its action to a special area in the mucosa.

The importance of constitutional treatment must not be forgotten. The bowels should be moved regularly by saline aperients; the aloes and iron pill is also useful. The preparations of quinine, iron, and strychnine, are valuable in improving the tone of the nervous and digestive systems.

Cold baths and sea-bathing aid greatly in strengthening the constitution. The water of certain mineral springs, such as Ems and Kreuznach, seems to have a special action on the uterine as on other mucous membranes. The regular diet and exercise required at these baths have also, no doubt, their beneficial effect.

The diathesis—strumous, tuberculous, or syphilitic—should not be forgotten. In them the treatment must from the first be constitutional.

SENILE ENDOMETRITIS.

LITERATURE. *Croom, Sir Halliday*—Senile Uterine Catarrh: Edin. Obst. Trans., 1897–98, p. 85. *Dunning, L. H.*—Acute Senile Endometritis: Amer. Journ. of Obst., 1900, p. 648. *Findley, Palmer*—Senile Endometritis: Amer. Journ. of Obst., 1901, p. 30. *Petric*—Endometritis Purulenta Senilis seu Atrophicans: Revue Med. de Suisse, 1893, No. 5. *Skene, A. J. C.*—Senile Endometritis: New York Med. Journ., March 10, 1894.

After the menopause a condition sometimes develops which has been described as senile endometritis. It is, however, rather an atrophic process, associated with necrosis of tissue and suppuration, and leading to destruction of the mucosa. It produces a purulent discharge, often fœtid, which is constant or may accumulate and come in gushes. It thus suggests malignant disease, and is sometimes accompanied by a cachexia with yellow skin and emaciation, from septic infection. There may be some bleeding, ascribed to sclerosis of the arteries causing infarction,[1] but it is not marked, nor is there the pain characteristic of cancer. The uterus is not enlarged and the other local changes of malignant disease (*v.* Chap. XLI.) are wanting.

The *treatment* is to wash out the uterine cavity with an antiseptic, and pack it with gauze, so as to ensure drainage. Sometimes curetting, followed by the application of iodised phenol or formalin is necessary. Cauterisation by steam has also been used in these cases.

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[1] By Palmer Findley. Climacteric hæmorrhage has been also thus explained by Reinicke—Die Sclerose der Uterinarterie: Archiv f. Gyn., 1897, p. 340.

CHAPTER XXXII.

METRITIS, ACUTE AND CHRONIC: SUBINVOLUTION.

LITERATURE.

Barbour—Article "Inflammation" in Allbutt and Playfair's System of Gynecology: London, 1896. *Barnes*—Diseases of Women, p. 507 : London, 1878. *Bennet, J. H.*—Practical Treatise on Inflammation of the Uterus: London, 1853. *Byford*—Medical and Surgical Treatment of Women : Philadelphia, 1881. *Courty*—Diseases of Women (Dr Agnes MacLaren's Translation : London, 1882). *De Sinéty*—Manuel de Gynécologie, pp. 315 and 351 : Paris, 1879. *Döderlein*—Die Entzündungen der Gebärmutter; Veit's Handbuch der Gyn., Vol. II., p. 249: Wiesbaden, 1897. *Fritsch*—Die chronische Metritis: Billroth u. Luecke's Handbuch f. Frauenkrankheiten, Stuttgart, 1885. *Gallard*—Traitement de la Métrite Chronique : Bull. gén. de thérapeut., etc., 1879, T. XCVII. 4—12, liv. *Guérin*—Ann. de Gyn., 1878, Tom. II. p. 9. *Klob*—Pathologische Anatomie der weiblichen Sexualorgane, S. 124: Leipzig, 1878. *Pozzi*—Traité de Gynécologie : Paris, 1897. p. 144. *Scanzoni*—Die chronische Metritis : Wien, 1863. *Simpson, Sir J. Y.*—Diseases of Women, p. 585 : Edin., 1872. *Vedeler*—Metritis Hysterica : Arch. f. Gyn., Vol. LXVI., p. 176.

Definition.—Inflammation in the muscular coat of the uterus leading, when chronic, to increased formation of connective tissue.

ACUTE METRITIS.

PATHOLOGY.

The uterus is enlarged and may be of the size of a goose's egg; it is thickened, specially antero-posteriorly, and of a doughy consistence. The peritoneal surface is usually covered with lymph.

On section the muscular wall is thickened, but soft and pulpy; the cut surface is of a bright red colour, shows the veins to be engorged, and yields on compression a yellowish-red exudation. The mucous membrane is thickened and vascular, but the cavity of the uterus is not altered in size. Microscopically, the muscular bundles are infiltrated with pus corpuscles.

ETIOLOGY.

Acute metritis is produced by extension of inflammatory action from the mucous or serous lining of the uterus to the intervening muscular tissue. It occurs most commonly as part of the general inflammation produced by absorption of septic matter during the puerperium, and from gonorrhœal infection.

It may be the result of surgical interference :—careless use of sound, intra-uterine injections, pessaries and sponge tents ; scraping the uterus, the removal of sub-mucous fibroids, operations on the cervix.

SYMPTOMS.

There is fever and general constitutional disturbance varying with the intensity of the inflammation. The onset may be marked by rigors. There is a sensation of fulness, weight, and burning heat in the pelvis; pain in the hypogastric and sacral regions, aggravated on movement of the body or the emptying of the bladder and rectum ; nausea and vomiting, diarrhœa and tenesmus of rectum and bladder.

Menstruation may be suppressed. In other cases, it is diminished in amount; exceptionally there is menorrhagia.

PHYSICAL SIGNS.

There is tenderness on pressure in the hypogastric region. On vaginal examination, the vaginal walls are hot and dry, the cervix is swollen and movement of it causes pain. The bimanual examination cannot be made on account of the pain and the resistance of the abdominal walls; if the patient be put under chloroform, the uterus will be felt to be enlarged but freely movable unless fixed by old adhesions (fig. 102). The sound should not be used.

PROGRESS AND TERMINATION.

The acute symptoms do not last usually more than a week. The fever and pain diminish; there is less heat in the pelvis and vagina, and leucorrhœal discharge becomes free. As complications, there may be catarrh of the bladder, rectum, or vagina.

The acute *usually* passes into the chronic stage to be immediately described ; though *sometimes*, under proper treatment and care, there is resolution with absorption of the exudation ; rarely does it terminate in abscess formation. Circumscribed abscesses in the uterine walls—recorded by Scanzoni, Reinmann, Bird, Ashford, Schroeder, Macdonald, and others—are sometimes produced and burst into the uterus itself; or adhesions may form and perforation take place into the bladder, vagina, rectum, and intestines, or even through the abdominal walls.

DIAGNOSIS.

The diagnosis that there is acute metritis and *nothing more*, is a refinement to which few would lay claim. But if the symptoms and physical signs are as described above, if the uterus be freely movable and no deposit is felt in the fornices, we may conclude that acute metritis is the prominent lesion. The possibility of abscess-formation should be kept in view. The practitioner may also, though very rarely, see cases where there is acute metritis and endometritis, and nothing else. It is wrong to say that acute metritis is rare. It is often a complication of pelvic peritonitis and cellulitis, with the physical signs masked by these latter diseases.

PROGNOSIS.

The *immediate result* will depend on the extent to which the peritoneum is involved. Even when the attack is not severe, the liability to pass into the chronic intractable condition makes us guarded in giving an opinion as to *complete recovery.*

TREATMENT.

Intra-uterine Injections.

If the metritis is supposed to be due to a septic cause, the first measure indicated is the *removal of that cause.* Thus if it come on during the puerperium, and the lochia are fœtid, the uterine cavity should be washed out with 1 to 40 carbolic or 1 to 4000 corrosive sublimate solution. If there is reason to think that anything has been retained, the uterus may be first curetted. In some extreme cases of puerperal sepsis hysterectomy[1] has saved the patient's life; the discussion of this subject, however, belongs to Obstetrics.

In all cases of metritis the patient must be kept *at rest.* This is done by keeping her recumbent. The bowels are evacuated by an enema—not by purgatives—followed by a morphia suppository. Pain is relieved by warm fomentations, to which turpentine may be added, applied over the lower part of the abdomen; but if it be severe, the patient should be kept under the influence of opium as already described in the treatment of pelvic peritonitis. If the temperature be above 102°, quinine should be given—10 grains every two or three hours—till it falls. The sulpho-carbolate of soda (15 grains) is useful in some cases.

CHRONIC METRITIS.

Synonyms.—Chronic parenchymatous inflammation (Scanzoni), subinvolution (Sir J. Y. Simpson), diffuse proliferation of connective tissue (Klob), infarct (Kiwisch), areolar hyperplasia (Thomas).

There has been great divergence of opinion among gynecologists as to the term which should be applied to the changes occurring in chronic metritis. Virchow described the process as a hyperplasia of fibromuscular tissue, and placed chronic metritis alongside of fibroid tumours of the uterus. Klob classed it among the new formations, and characterises it as "die diffuse Bindegewebswucherung"—"diffuse proliferation of connective tissue." Thomas called it "areolar hyperplasia," and Noeggerath suggested the term "diffuse *interstitial* metritis."

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[1] Zipperlen has collected seventy-six cases, *Brit. Med. Journ.*, 1900, Vol. II., Epitome No. 48.

From a *pathological point of view* the term "metritis" is incorrect, because there has never been demonstrated a chronic inflammation of the muscular fibre of the uterus. The morbid process described as chronic metritis consists in an *increase of connective tissue* out of proportion to that of the muscular fibre, which remains normal or is but slightly increased in quantity. We are not yet in a position to propose a term resting on a sure pathological basis; to do this would require a complete knowledge of the pathological changes, which has not yet been attained. We prefer to retain the term "chronic metritis."

From a *clinical point of view*, this term is very convenient, including a variety of cases of different origin, but presenting the same clinical features on examination.

It may be objected that to apply the term "chronic inflammation" to *the process* is misleading as it implies a previous acute stage which is rarely present; the process would be more correctly described as an increased connective-tissue formation dependent on long-continued hyperæmia. But the term chronic inflammation is applied to the process producing similar changes in other organs, as cirrhosis of the liver; chronic metritis produces, in fact, cirrhosis of the uterus.

Subinvolution of Uterus.

We have brought "subinvolution of the uterus" under this head, though in other English text-books it is treated as a separate lesion. The term subinvolution is *etiological* and simply expresses one mode, the most important one, in which the condition to be described is produced. *Apart from the history*, it is not possible to diagnose between a subinvoluted uterus and one enlarged by chronic metritis alone. Further, the condition of subinvolution is maintained by the process of chronic metritis, that is, by the formation of connective tissue which takes the place of the muscular fibre. Finally, the treatment is the same in both cases.

PATHOLOGY.

The condition of the uterus depends on the duration of the disease. At an early stage (as in cirrhosis of the liver) the organ is enlarged, hyperæmic, and soft; at a later period it is indurated, anæmic, and hard. The peritoneal surface is of normal colour, or shows here and there patches of extravasated blood. The enlargement is uniform, so that the shape of the uterus is not altered.

On section, the tissue is soft and hyperæmic in the early stage; firm, cartilaginous, and of a whitish colour (from the compression of the capillaries by the cicatricial tissue) in a later stage. The uterine walls are increased in thickness. The uterine cavity is increased in size.

De Sinéty.

"In the first period," says De Sinéty,[1] the dominant lesion is the presence in great numbers of embryonic elements throughout the whole thickness of the muscular wall. These elements are met with specially round the blood-vessels or form islands of variable dimensions which are more or less apart." The second period is characterised by two changes: (1) Marked dilatation of the lymphatic spaces, and (2) a localised hyperplasia of the connective tissue round the blood-vessels (fig. 178). The sclerosis, for such it may be called, differs from a similar change in the kidney or liver in the fact that the formation of connective tissue is localised round the blood-vessels. In the case described by De Sinéty, he says that it was difficult to say whether the muscular tissue was normal or diminished in quantity.

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[1] Gynécologie, p. 354.

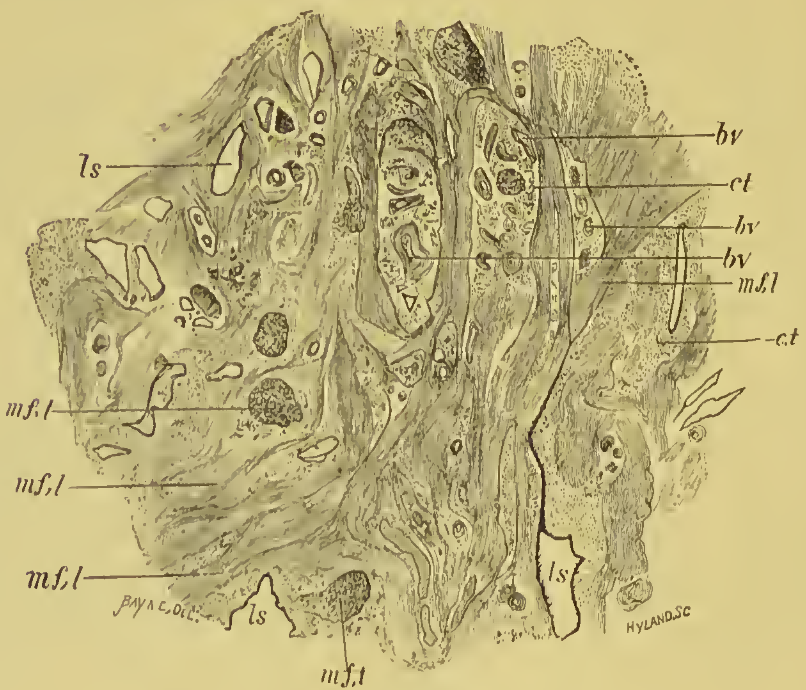

Fig. 178.

Section of the Uterine Tissue in a Case of Chronic Metritis $\frac{40}{1}$. *c t* connective tissue round the blood-vessels *b v*; *l s* dilated lymphatic spaces; *m f, l*, muscular fibre cut longitudinally; *m f, t*, muscular fibre cut transversely (*De Sinéty*).

Fritsch.

Fritsch[1] has examined uteri, extirpated for cancer, which showed the naked eye characters of chronic metritis. He notes the following pathological changes. (1) The disposition of the muscular fibre and connective tissue is less regular than in the normal uterus, and the latter is increased in quantity. (2) The blood-vessels are more numerous and more tortuous; the lumen of the vessel is often diminished; the tunica media is thickened; the contour of the vessel is masked through a connective tissue degeneration of its wall. (3) The lymphatic spaces appear gaping instead of as narrow clefts. (4) The peritoneum is thickened.

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[1] Luecke u. Billroth's Handbuch f. Frauenkrankheiten, Stuttgart, 1885, S. 917.

Cornil[1] also describes a new formation of connective tissue between the muscular fibres. This tissue does not contract cicatrically, but produces a permanent increase in volume.

Snow Beck. Snow Beck[2] also describes the presence of "an increased amount of round and oval globules, with amorphous tissue in the uterine walls." The increase in the size of the uterus is due to the presence of the soft tissue rather than to an increase in the muscular fibre.

ETIOLOGY.

The causes of chronic metritis may be arranged under two heads:—

A. Causes which operate through interference with the normal involution of the puerperal uterus;
B. Causes which operate through the production of repeated or protracted congestion of the uterus.

A. *Causes which operate through interference with the normal involution of the uterus.*

(1.) Retention of portions of placenta, membranes, or blood-clot in the uterus;
(2.) Lacerations of the cervix uteri;
(3.) Pelvic inflammations, occurring after labour;
(4.) Rising too soon after delivery;
(5.) Non-lactation;
(6.) Repeated miscarriages.

Puerperal Involution. In the process of involution there are two factors, the fatty degeneration of the muscular fibre and the removal of the products of this degeneration. The condition of permanent enlargement or subinvolution is not due to the non-degeneration of muscular fibre, but to the substitution of connective tissue for the products of this degeneration. This seems to be the reason why the process of chronic metritis is met with more frequently in those who have borne children. Sir John Williams[3] made the interesting observation that involution was distinctly retarded by removal of the ovaries.

Any source of irritation in or beside the uterus leads to chronic metritis; in this way we explain the effect of the *retention of portions of placenta or membranes.* An extensive *laceration of the cervix*, Emmet said, favours subinvolution for a similar reason. Continued *cellulitis or peritonitis* acts in the same way, or through interference with the circulation. If the patient *rise too soon*, the increased weight of the non-involuted uterus leads to passive congestion and formation of connective tissue. Passive congestion will, on the other hand, be diminished by whatever produces uterine contractions; the physiological stimulus of suckling, excited reflexly through the mammæ, favours involution; in *non-lactation* this stimulus is absent. *Abortions* are an important cause; because patients do not take so much care of themselves as after a full-time labour, and the stimulus of lactation is absent. After abortion conception readily takes place before the uterus has returned to its normal size, and this favours a recurrence of abortion.

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[1] Leçons sur l'anatomie pathologique des Métrites: Paris, 1889.
[2] Lond. Obst. Trans., vol. xiii., p. 239.
[3] Lancet, July 26, 1884.

B. *Causes which operate through production of repeated or protracted congestion.*

(1.) Displacement of the uterus;
(2.) Pressure of tumours in or near the uterus;
(3.) Causes producing increased flow of blood to the uterus, *e.g.* endometritis or too free use of caustics.

SYMPTOMS.

In the great proportion of cases, the patient *dates her suffering from a confinement;* frequently there is a history of repeated abortions. The patient finds, on rising after the puerperium that she does not regain her former strength. There is weakness in the back amounting in more severe cases to pain, a sensation of weight and bearing-down in the pelvis and of want of power in the limbs.

Menstruation is irregular and often increased in frequency and quantity, though this is more characteristic of endometritis. There is leucorrhœa from accompanying endometritis or cervical catarrh.

Effect on Reproduction.

The *reproductive function* is variously affected. Before the structure of the uterus has become permanently altered, pregnancy followed by early *abortion* may repeatedly occur. The cause of the abortion is probably the alteration which is taking place in the structure of the mucous membrane, rendering it unfitted for the development of the placenta; after an abortion, the conditions are peculiarly favourable for a second conception even before the uterus has had time to undergo involution; an excessive development of connective tissue gradually renders the uterus incapable of involution, and thus the condition of subinvolution is perpetuated. Should the pregnancy go on to full time, the presence of an undue proportion of connective tissue in the uterine wall leads in the third stage of labour to atony of the uterus and retention of the placenta; (see an interesting case of this reported by Kaschkaroff,[1] who gives the result of his microscopic investigation). After the condition has existed for some time there is *sterility*. This is due not so much to the changes in the uterus itself, though the leucorrhœa may prevent fertilisation, as to the ovaritis or pelvic peritonitis which is usually superadded; ovulation may be prevented by change in the structure of the ovary or by its being bound down by adhesions; the Fallopian tubes may be obstructed by cicatricial contractions.

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[1] Centralblatt für Gynäkologie, No. 5, 1879.

The general constitutional derangements are very important, and it is on account of these that the patients usually seek advice. Chronic metritis is one of the most important of the diseases of women; the suffering of the patient in cases of displacement of the uterus is due not so much to the displacement as to the chronic inflammation secondary to it.

Under the term *metritis hysterica*, Vedeler has recently drawn attention to certain cases in which subjective painful sensations are the prominent feature, a condition which Gooch first of all drew attention to under the term "Irritable Uterus." Although no other signs of inflammation are present there is marked pain on moving the cervix, or passing the sound through it. Sometimes the pain is not felt until the sound touches the fundus.[1] He considers it as part of the manifestations of hysteria, the local condition being not a cause but a result, and part of the trophic changes produced in the pelvis as in other organs.

PHYSICAL SIGNS, DIAGNOSIS.

The uterus is *equally* enlarged; there is no alteration in its form. The character of the enlargement is best understood by contrasting it with that due to pregnancy. In the second or third month of pregnancy, there is antero-posterior enlargement of the uterus; the vaginal finger comes on the anterior wall springing out from the cervix; the abdominal hand feels the rounding out of the fundus, combined with a softness which prevents us from distinctly defining its outline. In chronic metritis the vaginal finger does not feel any bulging of the anterior wall, and the abdominal hand recognises the fundus to be uniformly thickened; the outline of the latter may be felt with unusual distinctness through the greater firmness of the uterine tissue.

The enlarged uterus may be in its normal position, and freely movable or fixed by adhesions; it is often retroflexed.

The sound passes more than the $2\frac{1}{2}$ inches; it passes *readily*, and is felt to be freely movable in the uterine cavity.

DIFFERENTIAL DIAGNOSIS.

Diagnosis of Early Pregnancy.

The conditions which are most liable to be confounded with chronic metritis are *early pregnancy* and *small fibroid tumours*.

In a case of early pregnancy, the "having passed a period" will put us on our guard; some patients, however, menstruate after conception.

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[1] The "fundal endometritis" of Routh, "endometritis dolorosa" of Sneguireff.

Discolouration of the vagina points to pregnancy, but is often not marked. The softening of the cervix is a more reliable sign, unless pregnancy has occurred in a uterus which has undergone changes of chronic metritis. Our only sure guide is the bimanual examination, which shows us the change in the form and consistence described above. When the abdominal muscles are resistant, the finger can recognise per rectum the bulging and softness of the posterior uterine wall. The interesting question suggests itself in this connection, how soon it is possible to recognise the changes in the uterus peculiar to pregnancy. *How soon can we diagnose pregnancy?* Before auscultation was known the first reliable signs were fœtal movements; the date at which the mother first recognised these varied indefinitely. Auscultation gave us an earlier and more reliable indication in the sounds of the fœtal heart; these cannot be heard before the fourth month. The bimanual examination enables us to detect pregnancy from the eighth to the tenth week. We have under very favourable circumstances diagnosed it at the fifth week, and the subsequent history has confirmed our diagnosis.

For the differential diagnosis of chronic metritis from small fibroid tumours, we refer the student to the "Diagnosis of Small Fibroid Tumours" (Chap. XXXVI.).

TREATMENT.

Our first object is to diminish the passive congestion of the pelvic organs. The patient should be instructed to lie down for a few hours every day. Sedentary occupations or those that require the patient to stand for a long time in one position should be avoided. While enjoining a certain amount of rest, we must remember that rest becomes injurious when it interferes with nutrition. A certain amount of exercise, especially in the open air, should be as emphatically prescribed as a certain amount of rest.

Passive congestion is also diminished by giving local support to the uterus with a Hodge pessary; where the vagina is roomy, a soft ring pessary sometimes answers better.

The pelvic circulation is stimulated by vaginal injections; hot water will generally be found to be the most valuable; cold water is a more effectual stimulus, but few patients can stand it. The vaginal injection should be employed just before going to bed; the douche is preferable to Higginson's syringe (*v.* page 139). The injection should be continued from ten minutes to a quarter of an hour. It is a decided advantage to have the douche given with the patient in the *dorsal posture*, as Gallard recommends. Occasional warm baths are useful in some cases; when the patient is in the bath, the vaginal douche can be used at the same time with greater freedom and effect. A cold hip-bath every morning is the best stimulus to the circulation. *Medicinal baths* have a peculiarly beneficial effect in chronic metritis. Amongst those the first place has always been held by Kreuznach, the waters of which are specially rich in bromides and iodides. The baths at Kissingen are rich in carbonates, and are of a lower temperature than those of Wiesbaden and Baden-Baden which contain a smaller proportion of salts.

Mineral Waters in Chronic Metritis.

Further, the *drinking* of medicinal waters is also beneficial. The mineral springs at Ems and Vichy have, from their action upon the mucous membrane, always had a great reputation for the treatment of chronic uterine inflammation. Where there is much catarrh, they are specially serviceable. In scrofulous and chlorotic individuals, the advantage of waters which are rich in salts of iron is evident. Comparatively few of our patients, however, will be able to enjoy the luxury of a course of treatment at one of these watering places; but much benefit will be derived from change of air to the sea-side, or to the regular regime and cheerful surroundings of a hydropathic.

Attention to the action of the bowels is all important. Accumulations in the rectum and sigmoid flexure of the colon favour passive congestion, and interfere with the appetite and digestion. The mineral waters—Friedrichshall, Carlsbad and Hunyadi Janos—are the best aperients.

The Carlsbad salts are specially useful in bilious patients; a teaspoonful should be dissolved in a tumblerful of water and drunk in repeated sips during the morning. Friedrichshall and Hunyadi Janos waters act best mixed with an equal amount of hot water; their dose varies from a wineglassful to a tumblerful. A good substitute for these waters is the tonic and aperient description given on p. 231.

Ergot (twenty drops of the liquid extract thrice daily, increased to thirty at the menstrual period) and Hydrastis Canadensis (same dose of its liquid extract) are very useful, especially when there is menorrhagia.

The iodide and bromide of potassium may also be given internally, as recommended at p. 229.

Great care, and in some cases complete rest, should be enjoined at the menstrual period. As exacerbations usually occur at these times, a great deal is done towards a cure by prophylactic measures in regard to this.

Blistering of Cervix.

Of local treatment the most important is *counter-irritation* by occasional blistering or repeated application of iodine or of croton oil to the iliac regions. French gynecologists recommend the application of the blistering fluid to the cervix. Many gynecologists apply iodine to the cervix and roof of the vagina. The simple tincture of iodine, or a solution of equal parts of iodine and glycerine, may be applied in this way. *Local depletion* by scarification or leeches, as described under Endometritis, is less frequently employed than formerly.

In speaking of Emmet's operation, we mentioned that it was sometimes followed by diminution in the size of the uterus. Carl Braun[1] has shown that after *amputation of the cervix* for hypertrophy, the uterus sometimes undergoes changes which resemble those which occur physiologically in the puerperal uterus. Martin of Greifswald strongly recommends the amputation of the posterior lip.

Electricity has also been recommended by Apostoli for chronic metritis; it is more properly a treatment of endometritis, as it is to its cauterising action on the mucous membrane that beneficial results are due. Weir Mitchell's method of treatment by feeding and massage has given good results where the constitutional weakness has been the chief source of trouble. Both of these will be considered in the Appendix.

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[1] Zeitschr. d. Ges. d. Weiner Aerzte, 1864, S. 43.

CHAPTER XXXIII.

DISPLACEMENTS OF THE UTERUS: ANTEFLEXION; ANTEVERSION; RETROVERSION; RETROFLEXION;

LITERATURE.

Bandl—Ueber die normale lage u.s.w.: Archiv für Gyn., XXII., 408. *Bantock*—On the Use and Abuse of Pessaries: London, 1884. *Barnes*—Diseases of Women, p. 679: London, 1878. *Campbell, H. F.*—Pneumatic Self-replacement of the Gravid and non-Gravid Uterus: American Gynecological Transactions, Vol. I., 1876. *Croom, J. Halliday*—The Management of Anterior and Posterior Displacements of the Uterus: Brit. Med. Journ., 1888, I., p. 286. *Duncan, Matthews*—Diseases of Women, p. 403: London, 1886. *Emmet*—Principles and Practice of Gynecology, pp. 278 and 312: Philadelphia, 1884. A Study of the Causes and Treatment of Uterine Displacement: Amer. Journ. Obstet., 1887, p. 1040. *Fritsch*—Die Lageveränderungen der Gebärmutter: Billroth und Luecke's Handbuch, Stuttgart, 1885. *Hart*—The Structural Anatomy of the Female Pelvic Floor: Edinburgh, 1881. *Herman*—On the Relation of Anteflexion of the Uterus to Dysmenorrhœa: Lond. Obst. Tr., Vol. XXIII., p. 209. Pathological Importance of Flexions: Lancet, 1884, II., pp. 672, 729, 771. *Hewitt Graily*—The Mechanical System of Uterine Pathology: London, 1878. Importance of Flexions and Displacements: Lancet, 1884, I., pp. 1020, 1063, 1110; and Lancet, 1885, I., pp. 243, 284. The Early History and Etiology of Flexions of the Uterus: Brit. Med. Journ., 1886, II., p. 913. *Kelly*—Operative Gynecology: London, 1898. *Küstner*—Lage und Bewegungs Anomalien des Uterus und seiner Nachbarorgane: Veit's Handbuch der Gyn., Vol. I., p. 65, Wiesbaden, 1897. *Macnaughton-Jones*—Retroversion of the Uterus, etc.: Brit. Gyn. Jour., May 1901. *Ruge*—Congenitale Retroflexio: Zeitschrift für Geburtshülfe und Gynäkologie, 1878, Band II., S. 24. *Schultze, B. S.*—Ueber Versionen u. Flexionen u.s.w.: Archiv f. Gyn., Bd. IV., S. 373. Zur Frage von der patholog. Anteflexion der Gebärmutter: ibid., Bd. IX., S. 453. The Pathology and Treatment of Displacements of the Uterus—English Translation by J. J. Macan: London, 1888. *Simpson, A. R.*—Displacements of the Uterus: Allbutt and Playfair's System of Gynecology, London, 1896. *Simpson, Sir J. Y.*—Diseases of Women, pp. 253, 245, and 764, Edin. 1872. *Van de Warker*—The Relation of Symptoms to Versions and Flexions of the Uterus: Amer. Gyn. Trans., 1879, p. 334. *Vedeler*—Ueber Dysmenorrhoe: Archiv fur Gyn., XXI., 211. *Wylie*—Prevention and Treatment of Anteflexion and Anteversion: Amer. Jour. Obstet., 1884, p. 1261; and Edin. Med. Jour., XXX., 1148. The recent literature on the Operative Treatment of Displacements will be given under the various operations.

Preliminaries.

As the uterus is a movable organ within the pelvis, it is subject to various changes of *position;* as it is composed of muscular tissue, it is liable to alterations of its normal *curvature.* Both of these changes are described in English text-books as "displacements," although, strictly speaking, this term should be applied only to the former.

The normal form, position, and relations of the uterus have been already described (*see* Chap. II.).

The uterus is constantly exposed to forces producing a temporary displacement. In front there is the *bladder*, the dilatation of which displaces the uterus backwards and somewhat upwards (fig. 33). Behind there is the *rectum*, which normally should have little influence on the position of the uterus; but, owing to inattention to its regular evacuation, it is frequently over-distended and thus acts as a displacing cause operating from above and behind. Above there is the *abdominal pressure*, which is constantly acting on the uterus especially during inspiration. One has only to watch the movements of the anterior vaginal wall during respiration to see that this factor is always operating. Its action is of course increased by whatever increases the intra-abdominal pressure, that is, by any straining efforts which bring the abdominal muscles into play.[1] Below there is the *pelvic floor*, which has a constant action in supporting the uterus against the abdominal pressure.

One of the most important contributions on the normal position of the uterus and displacements produced pathologically is from Ziegenspeck.[2] He examined the condition of the pelvis *post-mortem* in 56 cases, in 35 of which he had previously noted the condition during life according to Schultze's method. After discussing the most important *post-mortem* changes, he mentions that he found the uterus anteflexed *post-mortem* in 24 out of the 56. His conclusions as to normal attachment of the uterus is thus summed up. The pelvic floor almost altogether supports and holds the anteflexed normally fixed uterus; the elastic traction of the vessels of the pelvic organs and of the peritoneum keep it in this anteflexed position. The uterus in this position is to a certain extent incorporated with the pelvic peritoneum, its attachment to the neighbouring organs being only of secondary importance. As to the pathological processes, he concludes that changes in the walls are only the result, never the cause of displacement. The fixation of the uterus was always more marked in cases of retroflexion than in those of pathological anteflexion. Peritonitic changes have little influence on the position of the uterus, while parametric ones are very important, being present in all cases of anterior and posterior displacement: in anterior, affecting the utero-sacral ligaments; in posterior, the cellular tissue round the uterine vessels and beside the bladder and anterior fornix of the vagina.

Physiological and Pathological Displacements.

We must distinguish between *physiological* and *pathological* displacement. The former is transient, and passes away when the cause has ceased to operate; the latter is persistent, and produces permanent alterations in form, position, and structure. It is difficult to draw the line between those two. The pathological condition is frequently due to simple overstepping of the limits of the physiological. Thus the carrying of the uterus backwards into a retroverted position by the distension of the bladder is physiological, while its remaining permanently in that position is pathological.

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[1] Tight-lacing will intensify this action of the abdominal muscles. Braxton Hicks believes that a concave disposition of the abdominal muscles, found in spare women, prevents the bladder from expanding upwards and forwards and makes it either unduly antevert the uterus (if it be already pathologically anteverted) or retrovert it: Lancet, 1886, I., p. 537.

[2] Ueber normale und pathologische Anheftungen der Gebärmutter und ihre Beziehungen zu deren wichtigsten Lageveränderungen: Archiv f. Gyn., Bd. XXXI., S. 1.

It is evident that the uterus can be displaced in at least three ways: *first*, the different parts of it may alter their position relative to one another; *second*, it may rotate round the transverse axis; *third*, the organ may be displaced as a whole. Any great rotation round the vertical axis is prevented by the attachments of the uterus.

Definitions.

1. Alteration in the relative position of body and cervix constitutes *flexion* of the uterus, in which there is a change in the curvature of the long axis, *i.e.*, in the direction of the uterine canal.

2. Rotation of the organ round an imaginary transverse axis constitutes *version* of the uterus.

3. Displacement of the organ as a whole, although frequently observed, has not been described in English works by a precise term. We might use the term *position* with the suitable prefix. Thus when the uterus lies "back as a whole" in the pelvis, it might be described as "a retroposition" or as "retroposed" (*Germ.*, retroponirt).

The uterus, in its normal condition, is anteflexed, anteverted, anteposed—placed as far forward as the bladder will allow.

Various deviations from the normal condition may occur.

1. The normal curvature may be exaggerated—anteflexion.

2. The uterus may be straightened, the normal angle becoming less pronounced and thus throwing the cervix more backwards—anteversion.

3. The uterus may be directed backwards—retroversion.

4. It may not only be turned backwards but the normal angle may be reversed, the fundus being bent backwards instead of forwards—retroversion + retroflexion.

5. The uterus may be displaced as a whole, usually by cicatricial contraction. This last condition is the most difficult to treat.

Etiology.

The *etiology* of flexions and versions is a subject of great importance. In a certain number of cases they are congenital, a fact to be borne in mind specially with regard to retroversion. In many cases they result from inflammatory conditions,[1] pelvic peritonitis, and especially cellulitis (*v.* p. 170). A knowledge of etiology guides us in prognosis and treatment. It indicates what cases we may hope to cure, and what cases we should leave alone, and how we can prevent the occurrence of displacements, as, for example, of retroversion in the puerperal condition.

Frequency.

Of the *frequency* of forward displacements we have no data, as there is no agreement as to what is to be considered a pathological degree of anteflexion or anteversion. As to backward displacements, Fränkel found them in 18 p. c. of gynecological cases;[2] while Schroeder[3] more recently, affirms that in 75 p. c. the uterus lies anteverted, and in 25 p. c. retro-displaced, two-thirds of the latter being versions and one-third flexions.

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[1] Ziegenspeck's researches confirm this from pathological anatomy.

[2] In 936 and 5180 cases in public and private practice from 1882-85. He found retroflexion commoner than retroversion, as 645 to 291. Ueber die Erfolge der mechanischen Behandlung, u.s.w.: Archiv f. Gyn., Bd. XXIX., S. 316.

[3] Zeits. f. Geb. und Gyn., 1900, Band XLIII., Heft. 3.

Symptoms. The *symptoms* of displacements have given rise to much discussion, some maintaining that they produce no symptoms at all. We sometimes, on examining a patient, find a retroflexion which has not made its presence felt by any symptoms. This is however the exception; as a rule, backward displacements are followed by a train of symptoms. *This apparent contradiction is to be explained by the fact that flexions and versions, in themselves, give rise to no symptoms primarily.* The symptoms arise *secondarily:* they are due (1) to interference with the functions of menstruation, conception, and pregnancy; (2) to chronic metritis and endometritis, which are produced by the displacement; (3) to pelvic cellulitis and peritonitis; and (4) to accompanying inflammation of the uterine appendages. Bantock in his interesting monograph on the Use and Abuse of Pessaries, gives very fully the various views held as to the significance of displacements as well as the results of his own experience.

ANTEFLEXION.

PATHOLOGY.

Anteflexion as has before been stated, is merely an exaggeration of the normal condition. As to its frequency, there is great difference of opinion. The reason of this diversity is that a degree of flexion which would be called pathological by one observer would still be called physiological by another. The question of symptoms does not help us in deciding this; because, on the one hand, we sometimes find an extreme degree of flexion although the patient does not complain of any special symptoms; on the other hand, symptoms often described as characteristic are due to a different cause. It is in fact worthy of consideration whether we should not limit the term anteflexion, as descriptive of a special lesion, to cases of pathological anteflexion resulting from inflammatory conditions of the cellular tissue. Anteflexion is more frequent in nulliparæ, while retroflexion is more common in multiparæ.

The usual *seat of the flexion* is at the upper portion of the cervix, or at its junction with the body. Flexion of the body itself is rare. Sometimes the cervix is bent sharply forwards, so that it lies in the axis of the vagina, and forms a distinct right angle with the body which is approximately in its normal position (see fig. 179). In other cases, the uterus is sharply curved on itself (see fig. 180). This last condition is sometimes mistaken for retroversion, because the finger feels through the posterior fornix the supra-vaginal portion curving backwards and the position of the fundus is not ascertained till the bimanual examination is made. In such cases the examination with one finger in the rectum is useful, as we can thus get above the point of flexion and feel that the fundus turns forwards.

The vaginal portion is frequently small and the os reduced to a pin hole (congenital cases); sometimes it is high up and difficult to reach, being drawn upwards and backwards by cicatricial bands. As regards the microscopic changes in the tissue, we are still in want of information. Virchow found no fatty degeneration of muscular fibre at the angle of flexion; the tissue was anæmic at this point but congested elsewhere. According to Rokitansky, the connective tissue framework of the uterus is thinnest at the os internum; hence the liability to flexion at this point.

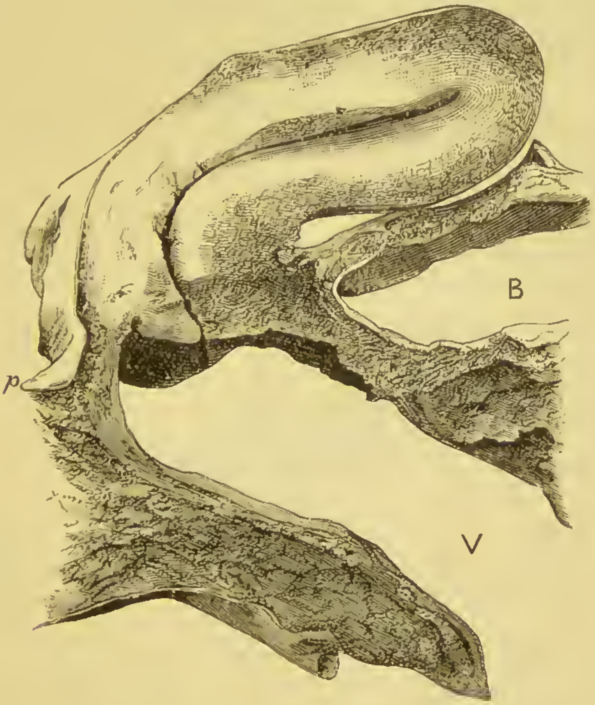

Fig. 179.

Anteflexion with Stenosis of Os Externum. *V* vagina, *B* bladder, *p* peritoneum of pouch of Douglas (*Winckel*).

ETIOLOGY.

Etiologically we distinguish two kinds of anteflexion, the congenital and the acquired.

Congenital Anteflexion.

In cases in which the anteflexion is *congenital*, the whole uterus is imperfectly developed, the cervix is small and the pin-hole os looks downwards and forwards.

Acquired Anteflexion.

As regards *acquired* anteflexion, it is undoubtedly often the result of inflammatory changes behind the uterus. In many cases of anteflexion, we observe that the cervix is higher than its normal position and far back in the pelvis; and that the attempt to bring it to its normal position produces pain. The cause of this condition was first brought into notice by Schultze,[1] who ascribes it to a cellulitis in the utero-sacral ligaments; this produces cicatricial contraction so that the cervix is drawn upwards and backwards, and the fundus thrown more forwards. Bandl thinks the first step in the process is a cervical catarrh; and that the inflammation spreads from the mucous membrane to the tissue of the cervix itself, making it more rigid, and thence to the cellular tissue round the cervix. Schroeder, however, held that the retraction of the cervix is produced by adhesions resulting from peritonitis. We draw attention especially to this cause of anteflexion, because it can be distinctly made out by careful examination. When it has been made out it is a contra-indication to hasty operative interference, and the prognosis as to cure is unfavourable.

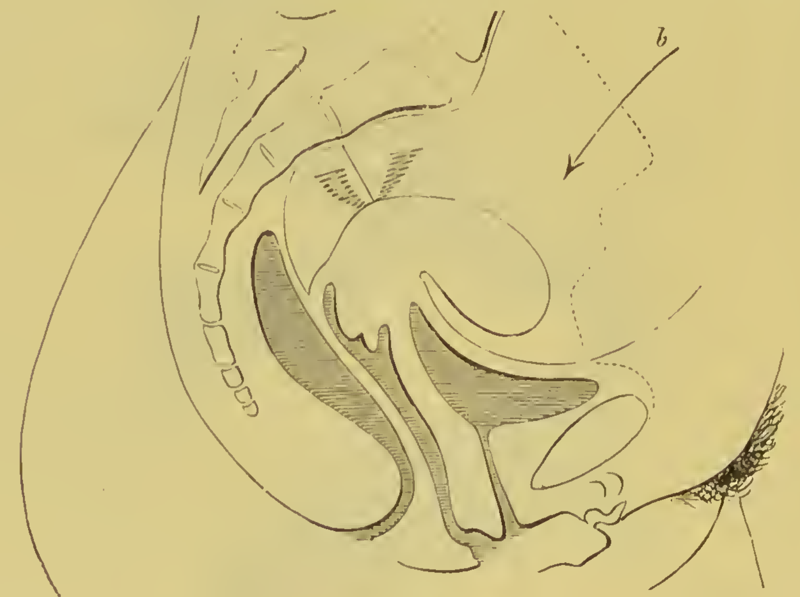

Fig. 180.

Diagram to show Anteflexion produced by Cicatrisation of Utero-sacral Ligaments. The arrow indicates the direction of the intra-abdominal pressure. (*Schultze*).

Hewitt's Views.

Graily Hewitt referred this, as all other flexions, to softness of the uterine tissue and thinness of wall, producing undue flexibility.

It is alleged that a fibroma, or other tumour increasing the weight of the fundus, will favour anteflexion if the fundus be directed forwards. In the commencing enlargement of pregnancy, the fundus droops more forwards or is at least more distinctly felt through the anterior fornix.

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[1] Loc. Cit., S. 414.

Unequal growth of the uterine walls has been given as the cause of congenital flexions, and unequal involution of the walls as the cause of flexions acquired during the puerperium. This is merely an explanation of how it is produced; the cause of this unequal growth requires, in turn, an explanation.

SYMPTOMS.

The most important symptoms of pathological anteflexion are—

Dysmenorrhœa,
Sterility.

It will be noted that these are the symptoms of pelvic and uterine inflammation and are not pathognomonic.

In many cases we find a well-marked anteflexion giving rise to no symptoms which patients complain of, as they are not accustomed to speak of sterility as a symptom.

Dysmenorrhœa. By this we understand that menstruation is accompanied with pain. The form of dysmenorrhœa present in anteflexion has been called "uterine," in contradistinction to "ovarian" (see Dysmenorrhœa, Section VIII.). By "uterine dysmenorrhœa," is meant that the pain is not marked until the menstrual flow has appeared and that it continues as long as the discharge continues. The pain is felt in the small of the back and sometimes in the pelvis generally, but is not localised in one ovarian region.

Two different explanations of this pain have been given. For convenience we describe these as the obstruction and the congestion theories.

Mechanical Theory of Dysmenorrhœa.

1. The *obstruction* or *mechanical theory.* According to this, the flexion of the uterus produces a narrowing of the uterine canal at the point of flexion.[1] Hence, when the menstrual decidua and blood are shed, they find an obstacle to their free exit. There is consequent retention and coagulation, and the coagula stimulate the uterus to muscular contractions to effect their expulsion. The mechanical resistance to the outflow of blood and the uterine contractions excited to overcome this, are the cause of the pain. The condition is like that in stricture of the male urethra. The blood, like the urine, collects but cannot be passed without pain; there is dilatation with sometimes secondary hypertrophy of the uterus in the former case, as of the bladder in the latter. It may fairly be objected to this mechanical explanation that the discharge is not always clotted, that in some cases it is very small in quantity, that it is doubtful whether the blood

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[1] It is doubtful whether this occurs. Graily Hewitt (Brit. Med. Journ., 1888, I., 461) figures a specimen where the lumen of the canal is flattened out laterally at the angle of flexion.

coagulates in the uterus, and that in many cases the pains complained of have not the distinctive character of labour pains. What has been already said with regard to Dysmenorrhœa ascribed to Stenosis of the Os externum (*v.* p. 288) holds good also here.

Congestion Theory.

2. The *congestion theory* is clearly stated and advocated by Fritsch.[1] According to this gynecologist, the dysmenorrhœa is not due directly to the bend on the canal. The pain arises from the resistance which the muscular tissue of the uterus offers to the hyperæmia. In normal cases, this tissue yields to the distending vessels; but when the uterus is small or bent on itself, there is an obstruction offered to the flow of blood. The mucous membrane cannot swell up as it does normally. Thus there is undue vascular tension and compression of the nerve endings in the uterus. This last causes the pain.

Whether this explanation harmonises better with the facts it is difficult to say; but we should suggest a modification of Fritsch's view. The flushing of any diseased tissue with blood causes an aggravation of pain, which is increased if the tissue be of a dense structure. The intense pain in periostitis as the affected limb becomes warm in bed, is thus accounted for. Now the tissues of the uterus are frequently in a state of chronic inflammation, and there is sometimes increase of connective tissue making it of less yielding structure; this occurs in retroflexion complicated with subinvolution. The monthly flushing of the pelvis with blood would, under these circumstances, be accompanied with pain. We must also remember that cellulitis and peritonitis are often present with anteflexion; and increase of pelvic congestion will, of course, produce increase of pain.

Sterility

Sterility is frequently associated with anteflexion; the patient is not so likely to refer to it, as the dysmenorrhœa is the more pressing symptom and that for which she seeks advice. This symptom has been referred to the obstruction in the uterine canal; as the menstrual blood is prevented from passing downwards, so the spermatozoa are prevented from passing upwards (*v.* also p. 289). But it is evident that this mechanical explanation is insufficient, because no mere contraction could prevent the passage of microscopic spermatozoa; and without doubt sterility is frequently the result of the binding down of the ovaries or the Fallopian tubes by concomitant inflammation. On the other hand there is the clinical fact that by passing the sound or dividing the cervix we place the patient under more favourable conditions for conception.

Dyspareunia—pain on sexual intercourse—is occasionally an important symptom, though naturally the patient does not refer to it. In such cases we generally find that there is inflammatory action behind the cervix.

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[1] Loc. cit., S. 35.

PHYSICAL DIAGNOSIS.

On vaginal examination the cervix is short, conical, and with a pinhole os in congenital anteflexion, high up and drawn backwards in acquired, in which also painful bands are felt in the posterior fornix (most distinctly on recto-vaginal examination). On bimanual examination, there is increased forward flexion of the uterus; and the whole uterus is displaced backwards in the pelvis in acquired anteflexion.

The sound is not necessary unless the bimanual is difficult; and should not be used when inflammation is present.

When the uterus is drawn backwards, the bimanual is difficult; hence from the direction of the cervix and the thickening behind it, such cases are often erroneously diagnosed as retroversion of the uterus.

DIFFERENTIAL DIAGNOSIS.

Differential Diagnosis of Anteflexion.

The only conditions which, after this careful examination, might yet be mistaken for an anteflexion are—

Myoma in the anterior uterine wall,

Cellulitis between the cervix and the bladder—a very rare condition.

Diagnosis from Myoma.

For a small myoma, the sound is required to tell the direction of the uterine cavity (fig. 181). The bimanual, with the sound in the uterus (*v.* fig. 78) is very useful in such cases.

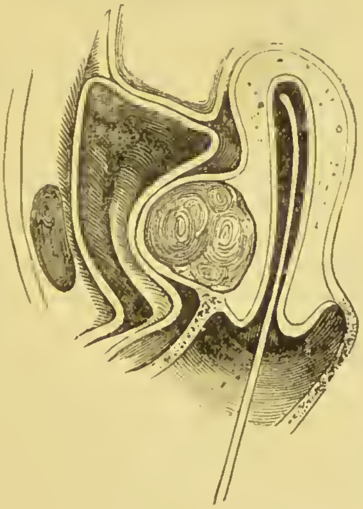

Fig. 181.

Sound Passed to show that a Myoma of the Anterior Wall is not an Anteflexion (*Leblond*).

From Cellulitis.

The diagnosis from *cellulitis* is less easy, because from the tenderness it is difficult to ascertain whether the body felt in the anterior fornix is the fundus uteri or a cellulitic deposit. Examination per rectum will assist in determining the position of the fundus when the abdominal wall is rigid.

PROGNOSIS.

The prognosis should always be guarded, for in cases of utero-sacral cellulitis, the course is chronic, and the relief of dysmenorrhœa always uncertain.

TREATMENT.

Pelvic inflammation, if present, must first be treated. Where the uterus is displaced by cicatricial bands, the stretching of these by massage has been suggested and is worthy of trial.

Treatment by Sound.

The treatment of congenital anteflexion is symptomatic, that is to say, directed to the relief of dysmenorrhœa and sterility without our being able to say whether they correct any pathological condition or not.

When dysmenorrhœa is prominent, dilatation of the cervix gives the best results; while for sterility, division is better. Dilatation is effected by expanding dilators, or graduated bougies (*see* p. 290). When the uterine cavity is enlarged and menstruation profuse, curetting after dilatation does good.

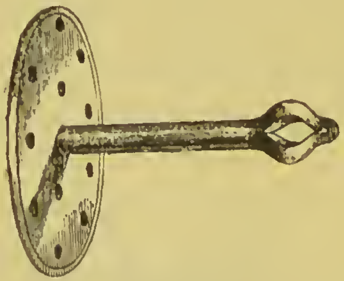

FIG. 182.

GREENHALGH'S INTRA-UTERINE STEM.

For sterility, division of the cervix is the usual operation (*see* p. 291). It does good by relieving the retention of cervical mucus, as well as by allowing free ingress for the spermatozoa. Should the cervix be large, the cervical amputation is preferable to simple division.

Treatment by Stems.

Intra-uterine stem pessaries (fig. 182) were employed in the treatment of such cases, but owing to the dangers attendant on their use have been abandoned.

ANTEVERSION.

PATHOLOGY AND ETIOLOGY.

The *pathological change* consists in a straightening of the uterine axis, so that the normal angle of forward curvature is diminished and the cervix passes more directly backwards. The uterus is usually enlarged and its texture is firmer. In this condition it is movable or fixed. If the former, its position varies with the distension of the bladder; if the latter, the fixed uterus will press more or less on the bladder as it distends and thus produce one of the symptoms of anteversion.

Significance of Anteversion.

As Anteversion is *the form and position taken up by the uterus when it is enlarged through chronic metritis*, it does not require special consideration. Its causes, symptoms, and diagnosis will be found in Chapter XXXII. So also its treatment has been discussed there. Various pessaries have been devised to support the enlarged uterus through the anterior fornix, of which two are shown in figs. 183 and 184; as it is impossible to do this, their principle is unscientific. Any practical relief which they give is got equally by a ring pessary, the use of which has been referred to under Chronic Metritis.

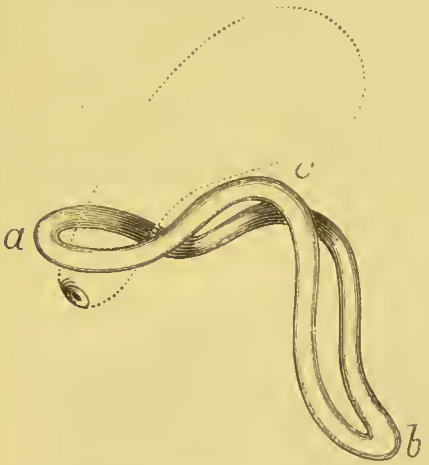

FIG. 183.

GRAILY HEWITT'S CRADLE PESSARY. *a* is in posterior fornix; *b* at vaginal orifice; *c* in anterior fornix (*Barnes*).

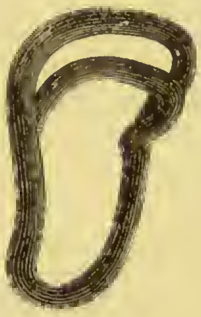

FIG. 184.

THOMAS' ANTEVERSION PESSARY. A Hodge pessary with a bar projecting into the anterior fornix, which is believed to hold up the fundus.

RETROVERSION.

PATHOLOGY AND ETIOLOGY.

Physiological Retroversion.

Physiological retroversion occurs whenever the bladder is fully distended (*v.* fig. 33). This is distinguished from the pathological condition by the fact that it is transient, and ceases when the bladder is emptied.

Pathological Retroversion.

Pathological retroversion is found under the following conditions.

1. It occurs congenitally—which we assume when we find, on examining a virgin or nullipara, the uterus retroverted and either no symptoms or a history of symptoms going back to puberty. This is by no means a rare condition in virgins, as Küstner found it in 21°/ₒ of private and

$13^{\circ}/_{\circ}$ of hospital cases of backward displacement; and Graily Hewitt in $23^{\circ}/_{\circ}$ of cases (60 out of 259) noted in his private practice during thirteen years.

2. During the first days of the puerperium the uterus lies retroverted, or at least retroposed. The weight of the uterus and the laxity of its attachments make it occupy this position when the patient is recumbent.

3. It occurs in the course of prolapsus uteri (*v.* Section VII.). The axis of the uterus changes its direction as the organ descends.

4. It is also a stage in the production of retroflexion—the most frequent and important displacement which calls for treatment. The uterus becomes retroverted, and then acquires a backward flexion.

5. Chronic peritonitis producing obliteration of the pouch of Douglas, and cicatricial bands which drag the uterus backward, maintain, if they do not produce, retroversion—as is beautifully shown in the accompanying preparation from Winckel's Atlas (fig. 185).

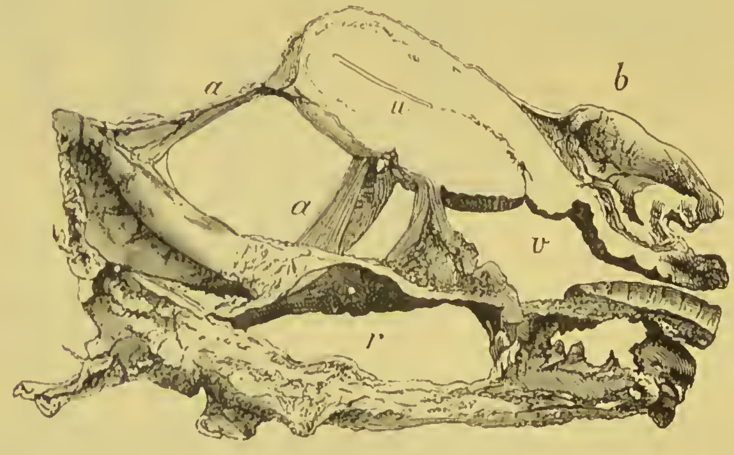

FIG. 185.

UTERUS RETROVERTED AND BOUND BACK BY PERITONITIC ADHESIONS (*Winckel*). *aa* adhesions; *b* bladder; *v* vagina; *u* uterus; *r* rectum (½).

The chief *causes* of retroversion are:—

1. A sudden straining effort, or a violent blow (a very difficult cause to establish); [1]
2. Non-return of the uterus to its normal form and position during the puerperium;
3. Inflammatory action behind the uterus, producing adhesions in the pouch of Douglas; or cicatrisation of the anterior vaginal wall. [2]

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[1] Graily Hewitt says that in 58 cases of backward displacement in virgins, nearly one-half (28 cases) traced their symptoms back to a severe fall, accident or strain; but this does not establish any of these as the cause.

[2] This acts by drawing the cervix forwards. Murdoch Cameron mentions a case where after division of a bridle on the anterior vaginal wall, the retroverted uterus became normal.—*Glas. Med. Journ.*, 1887, p. 420.

SYMPTOMS.

The symptoms of retroversion are the same as those found in retroflexion, to be presently described. When it arises during the puerperium, a late flooding—two to three weeks after labour—is sometimes a prominent symptom; or there is a daily loss of blood in small quantities whenever the patient rises and goes about (*Fritsch*).

DIAGNOSIS.

On vaginal examination, the cervix is low down in the pelvis and the os looks downwards and forwards. The finger feels the supra-vaginal portion of the cervix through the posterior fornix and may be able to reach the fundus, but the posterior surface is straight—there is no angle.

Bimanual in Retroversion.

On bimanual examination, the hands can meet in the anterior fornix with nothing but the vaginal and abdominal walls between them. It is difficult to make out the body of the uterus. We may try to do this in two ways. *First*, with one finger in front of the cervix and the other behind it, lift the uterus upwards towards the abdominal walls; the hand placed on the abdomen will feel the anterior surface of the body of the uterus moving under it. *Second*, tilt the cervix well forwards with the index finger in the vagina, and thus increase the retroversion; the middle finger will feel the body of the uterus through the posterior fornix.

The rectal examination is of great service here. The sound will pass as in fig. 74.

The differential diagnosis is the same as in retroflexion. The only point requiring special notice here is that we may have a retroversion with an anteflexion high up. Cases of anteflexion due to cicatrisation of the utero-sacral ligaments are often, from the forward direction of the cervix, diagnosed as a retroversion (*v.* p. 360).

TREATMENT.

This consists in (1) removing existing inflammation; (2) replacement of the uterus when not fixed by adhesions; (3) retention of it in its normal position by pessaries: these will all be considered under retroflexion. Congenital cases should be left alone.

When the uterus is fixed by adhesions it cannot be replaced, and if the symptoms are not relieved by the support of a pessary, surgical interference is called for.

RETROFLEXION.

For convenience this condition is usually called "Retroflexion," to distinguish it from "Retroversion" already described; strictly speaking, the condition is **RETROVERSION + RETROFLEXION.**

PATHOLOGY.

The pathological changes in the position and structure of the organs in the pelvis consequent on retroversion + retroflexion, can be learned only from sections made with the organs *in situ.*

The following facts are based more on clinical examination than on pathological study. The changes in the various structures will be considered separately and shortly in a typical case of retroflexion in a multipara.

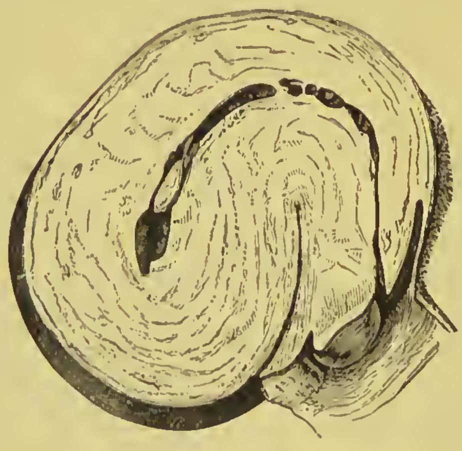

FIG. 186.
EXTREME RETROFLEXION OF UTERUS (*Barnes*).

The *cervix* is directed downwards and forwards, or directly downwards (*v.* fig. 188). We observe clinically that it is very easily reached. This is due partly to the alteration in its direction and position (being nearer the symphysis pubis it is more within reach), partly to the sinking down of the uterus as a whole in the pelvis. The os is patulous, because retroflexion usually implies previous parturition. If deeply fissured, it may form a gaping cleft which readily admits the tip of the finger. There is often ectropium and cervical catarrh. Sometimes there is marked hypertrophy of the posterior lip, so that it is mistaken for the projection of the whole vaginal portion.

The *uterus* is flexed on itself, so that the fundus lies in the pouch of Douglas, the depth to which the fundus descends and the acuteness of the angle of flexion varying in different cases (*v.* figs. 186 and 188). If the condition of the uterine walls offers no resistance to flexion, the intra-abdominal pressure will tend to drive the fundus downwards till equilibrium is maintained—that is, till the fundus rests in the bottom of the pouch of Douglas.

Condition of the Uterus in Retroflexion.

The size of the uterus is increased, and its cavity measures more than two and a half inches. Since the flexion generally occurs while the uterus is still enlarged through subinvolution, it is difficult to say whether this hypertrophy arises as the direct result of the displacement or through its interfering with the process of involution. Whatever the cause of this hypertrophy is, its effect is to interfere with the natural cure of the displacement. The thickness of the uterine walls at the angle of flexion varies in different cases. Sometimes neither wall is atrophied at the point of flexion (fig. 186). Barnes says that according to his clinical experience this is the usual condition. On the other hand, Fritsch states that he has found marked thinning of the *posterior* wall at the angle of flexion. It is interesting to note that in a case of *congenital retroflexion* (see fig. 187) described by Ruge it is the *anterior wall* which is atrophied at the angle. The mucous membrane of the uterus is generally in a condition of chronic catarrh.

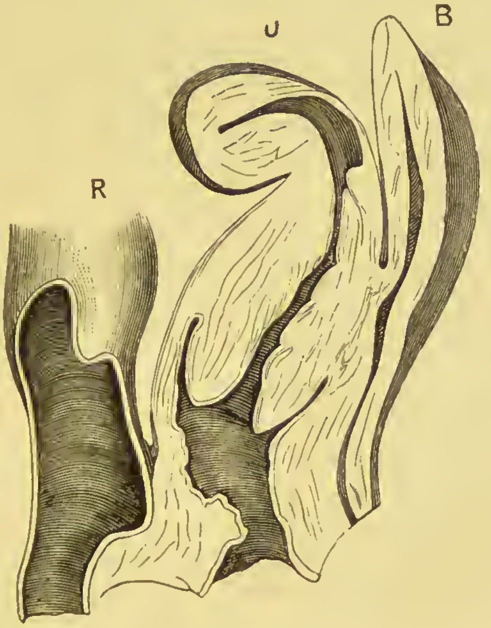

Fig. 187.

Congenital Retroflexion (*Ruge*). Note the thinning of the anterior wall of the uterus.

The microscopic changes consist in a dilated condition of the bloodvessels, with increase of connective tissue—the appearances produced by long-continued passive congestion. At the point of flexion, however, an opposite condition has been described; the blood-vessels were compressed and the tissues atrophied.

Ovaries in Retroflexion.

The *ovaries* follow as a rule the displaced fundus, the thin infundibulo-pelvic ligament stretching more readily than the ovarian. The position of the ovaries will, however, depend on the effects of peritonitic adhesions, which may fix them in any position. Sometimes we feel them below the fundus in the pouch of Douglas. They are frequently enlarged and tender on pressure.

Bladder in Retroflexion.

The *bladder* is not necessarily altered in position, but has no longer the uterus resting upon it. The utero-vesical pouch is obliterated in cases of well-marked retroflexion. The ureters are often compressed or bent, which leads to dilatation; frequently they are found dilated to the thickness of the finger. Fritsch observed in one case the left ureter obliterated by a mass of cicatricial tissue, and the corresponding kidney changed into a sac full of white atheromatous debris.

The *rectum* may have the retroflexed fundus pressing against its anterior wall.

The *peritoneum* is altered in its normal relations as follows. The broad ligaments have their surfaces reversed, that is to say, the anterior which was formerly inferior, is now superior; from their attachments, they offer no obstacle to retroflexion. The utero-vesical pouch necessarily disappears. The pouch of Douglas will, on the other hand, be distended by the fundus uteri; this implies *stretching of the utero-sacral ligaments* associated with the alteration in position of the cervix.

The *pelvic nerves* are occasionally affected, as shown by weakness in the lower limbs. This loss of power must be produced reflexly; from the anatomical relations, the retroflexed fundus cannot compress the motor nerves of the sacral plexus as is sometimes affirmed.

ETIOLOGY.

Retroflexion is, according to Fränkel's statistics, more common than retroversion.[1] Schroeder, on the other hand, finds that only one-third of all cases of backward displacement are flexions, the other two-thirds being versions. As a *congenital* condition, it is not nearly so frequent as anteflexion. It is more common in multiparæ than in nulliparæ, because the etiology is specially related to the *puerperal condition.* In this condition the uterus is enlarged and heavy and its walls are soft. The ligaments are lax, and the tissues of the pelvic floor have been recently stretched and have not recovered their tone. Through the distension of the bladder, the uterus is often thrown into a retroverted position.

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[1] In 1882-85 he treated 936 retrodeviations of uterus, of which 645 were retroflexions and 291 retroversions.

We sometimes find on examining a patient shortly after her confinement that the uterus is lying back in the pelvis even though the bladder be not distended; we may thus suppose that the *intra-abdominal pressure* (which, when the uterus is in its normal position, is directed upon its posterior surface) comes now to act on the anterior surface and drives the fundus backwards and downwards. If the uterine tissue is soft enough to allow the fundus to be flexed on the cervix, such a flexion will gradually take place when the patient makes straining efforts. Apart from this, the *dorsal posture* and the common practice of *tight bandaging* after confinement will favour backward displacement of the fundus. If the patient *rise too soon* while the uterus is still large and heavy and the uterine supports correspondingly lax and weak, the tendency to displacement is increased.

The cause of retroflexion in nulliparæ is obscure.

SYMPTOMS.

Local Symptoms of Backward Displacement.

The following are the more important local symptoms, to be found in cases of backward displacement.

Weakness in the back,
Symptoms of chronic pelvic peritonitis,
Painful defæcation;

Leucorrhœa,
Dysmenorrhœa,
Menorrhagia;

Sterility,
Abortion.

In long-standing cases, there may follow the train of general constitutional symptoms consequent on chronic uterine disease.

The symptoms are arranged in three groups: the first, including those which are more or less continuous; the second, those which are within the menstrual period, variable or periodic; the third, those connected with the function of reproduction.

The connection between the symptoms present in cases of retroflexion and the displacement itself has given rise to much discussion and difference of opinion; and here we must emphasise what was said on page 360 that the symptoms are not due to the lesion immediately but to other pathological changes consequent on or associated with it. Herman[1] would refer the symptoms in displacements entirely "to weakness and over-stretching of the muscular and ligamentous tissues which support the uterus," but we cannot thus ignore chronic metritis and endometritis and the disturbances of menstruation and reproduction. On the other hand, in judging of the symptoms of retroflexion we must keep before us Vedeler's[1] statistics, who found in 40°/。 of cases of retroflexion no symptoms, and concludes that every degree of retroflexion may exist either with or without symptoms.

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[1] The Pathological Relationship of Uterine Displacements: Brit. Med. Jour., 1888, I., p. 1213.

Weakness in the back is the most common complaint. It may amount to actual pain, which is aggravated on muscular exertion and generally at the menstrual periods. The symptoms of *chronic pelvic peritonitis* are usually present; the feeling of weight and discomfort in the pelvis is sometimes due to the stretching of old adhesions. The importance of pelvic inflammation, fixing the uterus in its abnormal position and preventing its replacement, we shall consider under treatment. *Painful defæcation* with tenesmus is explained by the relation of the loaded rectum to the retroflexed uterus; irritation from pressure of the fundus against the wall of the rectum may produce straining efforts, but this is very rare.

The *leucorrhœa* is due to chronic inflammation of the mucous membrane. As the result of the displacement, there is passive congestion of all the tissues of the uterus; this leads in the first instance to a simple hypersecretion of mucus, which gradually passes into chronic inflammation. The mucous secretion is more marked immediately after the increased congestion of the menstrual period; but, gradually, it spreads itself over the intermenstrual period. *Dysmenorrhœa* is not so frequent a symptom here as in anteflexion; the explanation is, on the mechanical theory, that retroflexion usually occurs in multiparæ where the cervical canal is patulous. *Menorrhagia* forms one of the more prominent symptoms; it is due partly to the chronic inflammation of the mucous membrane, partly to obstruction to the return of the blood from the uterus.

Affection of Reproductive Function.

The *reproductive function* is variously and seriously affected. This is brought under our notice when retroflexion occurs in one who has already been pregnant, and presents an obstacle to conception or at least to the growth of a fertilised ovum in the uterus. Sometimes a patient tells us that she had a child several years ago; that she has suffered from pain in the back, leucorrhœa, and irregular menstruation since that time and has never conceived again. With this history, we may find retroflexion of the uterus although often it is the tubes that are at fault.

The *sterility* may, of course, be due to a variety of causes—the altered position of the cervix, the increased mucous secretion, obstruction of the Fallopian tubes, malposition of the ovaries. We cannot, therefore, be sure of curing the sterility by replacing the uterus, although we frequently find that the patient *does* conceive shortly after this treatment.

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[1] Retroflexio Uteri: Archiv f. Gyn., Bd. XXVIII., S. 228.

After conception has taken place, there is the further risk of *abortion;* with a history of repeated abortion, we sometimes find retroflexion. Conception probably often takes place in a retroflexed uterus, which afterwards may right itself so that pregnancy goes on to the full time. Abortion is due to the inability of the uterus thus to right itself, or to the pathological condition of the mucous membrane which prevents the ovum from becoming securely attached. When abortion does not occur and the pregnant uterus does not straighten itself so as to grow upwards into the abdomen, it enlarges without the undoing of the flexion; in this case it will expand more and more into the hollow of the sacrum and become wedged below the promontory. This constitutes Retroflexion of the Gravid Uterus.

Abortion in Retroflexion.

DIAGNOSIS.

On *vaginal* examination the cervix is felt low down in the pelvis, the cause of which has been explained under Pathology. The os looks directly downwards. A firm round body is felt in the posterior fornix, continuous with the cervix uteri but separated from it by a groove more or less distinctly marked according to the amount of flexion. Place the forefinger on the cervix, and the middle finger on this body; on moving the former, the latter moves with it.

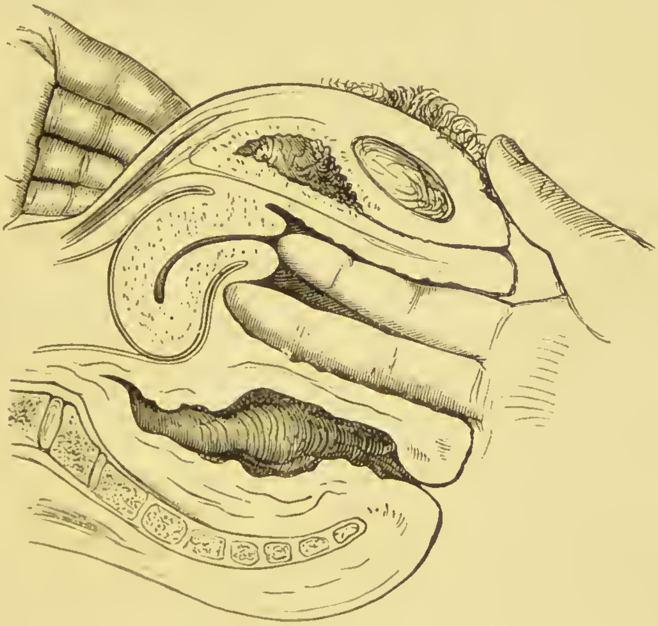

FIG. 188.

DIAGNOSIS OF RETROFLEXION BY BIMANUAL EXAMINATION.

But a fibroid tumour of the posterior wall would produce similar conditions; therefore make the *bimanual* examination. First place the vaginal fingers in the anterior fornix and make pressure with the external hand until the fingers of both hands meet; there is nothing between them except the abdominal and vaginal walls, the fundus is therefore not to the front. Now put the vaginal fingers into the groove behind the cervix, or, better still, lay hold of the cervix with the index finger in front of it and the middle finger in the groove behind (*see* fig. 188), and lift up the uterus as high in the pelvis as possible; make pressure with the external hand until the cervix lies fairly between the hands; the upper surface of the uterus is felt to curve backwards. In a favourable case (with lax abdominal walls) we can do the bimanual examination on a still deeper plane, and get both hands to meet behind or at least fairly embrace the retroflexed fundus. Having ascertained that the fundus uteri is retroflexed, we ask ourselves whether it be fixed or movable—*whether it can be replaced or not.*

Rectal Examination in Retroflexion.

The *rectal* examination has this advantage, that the finger passes upwards over the free surface of the fundus without displacing it. It is indispensable in cases where the rigidity of the abdominal walls prevents our getting the uterus between the hands in the bimanual. The drawing down of the uterus with the volsella is an additional help in such cases, as it enables the finger in the rectum to reach the fundus.

Uterine Sound in Retroflexion.

The *sound* confirms the diagnosis in doubtful cases, and tells us further whether the retroflexed uterus is enlarged. Before using the sound, we must palpate the uterus carefully to ascertain that it is not becoming enlarged with a growing ovum, and inquire as to the patient's menstruation. We curve the sound to correspond with the degree of flexion ascertained on bimanual examination. If introduced with the concavity directed backwards, it passes into the uterine cavity without our having to make the rotation (*v.* fig. 74); through the posterior fornix we feel the end of it in the retroflexed fundus; it usually passes in beyond the two and a half inches. We can also learn from the sound whether the uterus can be replaced or not; but it is better to get the information from the bimanual examination. The sound is of most use in differential diagnosis.

Differential Diagnosis of Retroflexion,

Differential diagnosis. The following are the conditions arranged in the order of frequency, which might be mistaken for retroflexion:—

Fæces in the rectum;

Pelvic deposit in the pouch of Douglas $\left\{\begin{array}{l}\text{Peritonitis,}\\ \text{Hæmatocele,}\\ \text{Carcinoma;}\end{array}\right.$

Cellulitis behind the cervix;

Myoma of the posterior wall;

Prolapsed ovary or small ovarian tumour or dilated tube.

from Loaded Rectum,

Fæcal matter in the rectum gives rise to difficulty only on superficial examination. We should always decline to give an opinion as to the condition of the pelvic organs when the rectum is loaded. If this be attended to, no mistake in diagnosis will be made under this head.

from Pelvic Deposit,

Pelvic deposit in the pouch of Douglas gives rise to more difficulty, because it may closely simulate the condition found in retroflexion—"a body felt through the posterior fornix and moving along with the cervix." Such a deposit will be proved not to be the fundus uteri by our finding the latter in another position. If inflammation is present, it is difficult to make the examination necessary to ascertain this; we may not be justified in using the sound just where it would give us the desired information: such cases present great difficulty in diagnosis, and the true condition can only be ascertained on special examination or after the inflammation has subsided.

from Cellulitis,

Cellulitis behind the cervix is rarely present in such a form as to give rise to a mistake in diagnosis, unless the inflammation renders the necessary examination difficult.

from Myoma,

A *myoma* projecting posteriorly from the lower segment of the uterus resembles, in form and firmness, the retroflexed fundus. On Bimanual examination, however, we find that we have between the hands a larger body than the uterus alone. The fundus may also be felt to the front, and distinct from the tumour. To ascertain its position, it is best to make the bimanual examination with the sound in the cavity of the uterus. Fig. 181 shows the information given by the sound, if we suppose that the structure to the left of the figure is the rectum. A fibroid tumour accompanied by inflammation presents great difficulty.

from Prolapsed Ovary or Tube.

If the *ovary* be *prolapsed*, enlarged through inflammation, and adherent to the posterior aspect of the uterus, it simulates (on vaginal examination) the retroflexed fundus. So also does a small *ovarian tumour* or *dilated tube* lying in the pouch of Douglas, though these are softer and more elastic than the uterus. The bimanual examination, supplemented if necessary by the use of the sound and the drawing down of the uterus with the volsella, enables us to ascertain the exact position of the fundus and its relation to the tumour.

PROGNOSIS.

Possibility of Cure of Retroflexion.

The prognosis depends upon the mobility of the uterus and the possibility of replacing it. It is always less favourable where inflammation is present; though we have seen considerable exudations become after a time absorbed, and the uterus again movable so that it could be replaced. As regards the probability of future conception, our statements should be guarded; though the probabilities are increased if we can replace the uterus.

Whether a permanent cure of the displacement (so that the uterus will keep its normal position after the instrument is removed) is often effected, we have not much definite information. *A priori*, we should not expect that the stretched utero-sacral ligaments would readily become shortened again unless a pregnancy supervene. The curability of the retroflexion depends, according to Mundé, on the *recency of the displacement;* "recent displacements of any variety are the only cases which offer a fair chance of complete recovery by any of the mechanical means at our disposal." The length of time during which a pessary must be worn so as to effect a cure of recent puerperal retroflexion is, according to Mundé, six months to a year.

TREATMENT.

Here we have to consider:—

(1.) The treatment of associated inflammatory conditions;
(2.) The reposition of the displaced uterus and its retention by means of pessaries;
(3.) The operative treatment of these displacements.

1. *The treatment of associated inflammatory conditions.*—Often there is some inflammatory condition of the appendages which may or may not be the result of the displacement, but which is usually the starting-point of the perimetritis, often also present. Further, there is the chronic metritis which is the important factor in the clinical picture of a retroflexion with characteristic symptoms. The displacement *per se* is usually symptomless; the rôle it plays is to produce a vulnerability of the tissues to inflammatory conditions.

The treatment of these various inflammatory conditions has been already discussed (*v.* chapters on peritonitis, salpingitis, ovaritis, and chronic metritis). It is referred to again here to emphasise the fact that displacements are often of minor importance. Further, so long as active inflammation is present, it is a contra-indication to the reposition and retention by pessaries which has now to be considered.

2. *The reposition of the displaced uterus and its retention by means of pessaries.*—This is only applicable to cases of movable retroflexion, without marked tenderness beside the uterus. Congenital cases should not be thus treated, and it is an open question whether, if retroflexion be found in an unmarried patient local treatment by pessaries is desirable. Further, if the uterus is fixed by adhesions, reposition is impossible unless these are broken down.

Schultze's method of doing this by manipulation under chloroform has not found much favour in this country. He aims not so much at forcible reposition, as the loosening of adhesions through careful bimanual stretching.

Method.—Bladder and rectum are empty; dorsal posture, thighs flexed and abducted. Irrigate the rectum with warm water. With the index and middle fingers in rectum and the external hand grasping the fundus, lift the uterus carefully up. Slight adhesions yield to pressure of fingers; broader ones are stretched by the ends of the fingers, although repeated attempts may be necessary. A pessary introduced after reposition.

He also attempts to replace adherent prolapsed ovaries in the same way.

To replace the retroflexed uterus, there are three methods:—

(1.) By bimanual manipulation;
(2.) With the sound;
(3.) By genupectoral posture, combined with traction by volsellæ.

(1.) *Bimanual manipulation* is the safest method, but from its discomfort to the patient is not much used. It may be done with the fingers in the vagina as in fig. 188, or better still with one in the vagina and the other in the rectum as in fig. 189. Pressure is not made with the other hand until the uterus has been pushed round to the front.

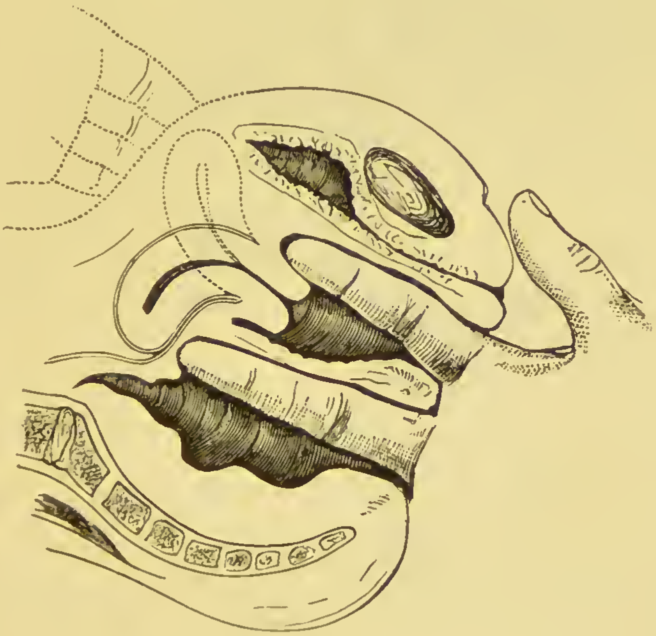

Fig. 189.

Reposition of the Retroflexed Uterus by the Finger in the Rectum.

(2.) The method of *replacement with the sound* will be evident from fig. 190. After passing the sound as in fig. 190, it is not rotated on its long axis, but swept round in a curve to the position of 2: the rough surface of the handle which looks backward in 1, looks forward in 2. It is then moved directly backwards to **3**, the uterus being thus replaced, the sound is withdrawn and a pessary introduced.

Various forms of uterine repositors have been devised by Sims and others. They resemble a sound with the intra-uterine portion jointed to the stem, on which it is moved by a suitable mechanism. They are of no practical value.

(3.) The importance of the genupectoral posture in replacing the retroflexed uterus was brought forward by H. F. Campbell. On placing the patient in this posture, the abdominal contents gravitate downwards and forwards: this displacement withdraws the internal pressure from the pelvic floor, so as to subject it to the atmospheric pressure from without. If the vaginal orifice be now opened, the vaginal cavity becomes distended with air; if the walls are lax, the cavity may be so large that the finger reaches the cervix with diffi-

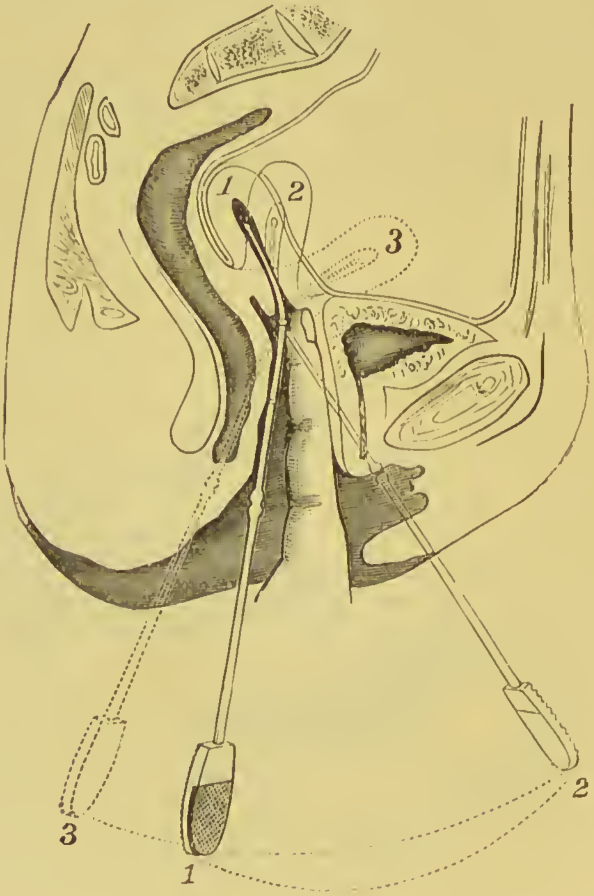

FIG. 190.

REPLACEMENT OF THE UTERUS WITH THE SOUND. 1, 2, 3, the successive positions of the SOUND and of the UTERUS.

The Retroflexed Uterus in Genupectoral Posture.

ulty. The position of the uterus changes;[1] but the retroflexed uterus loes not become replaced, as Campbell supposed. It moves as a whole iear the sacrum; and, if already retroverted, it becomes still more so. To effect replacement, we must either push the fundus forwards or draw the cervix backwards. It is best to combine these actions; having laid hold of the cervix with the volsella per vaginam, we draw it downwards while with the index finger of the right hand, per rectum, we press the fundus towards the bladder (see fig. 191). This method of reposition is only used in cases of retroflexion of the gravid uterus.

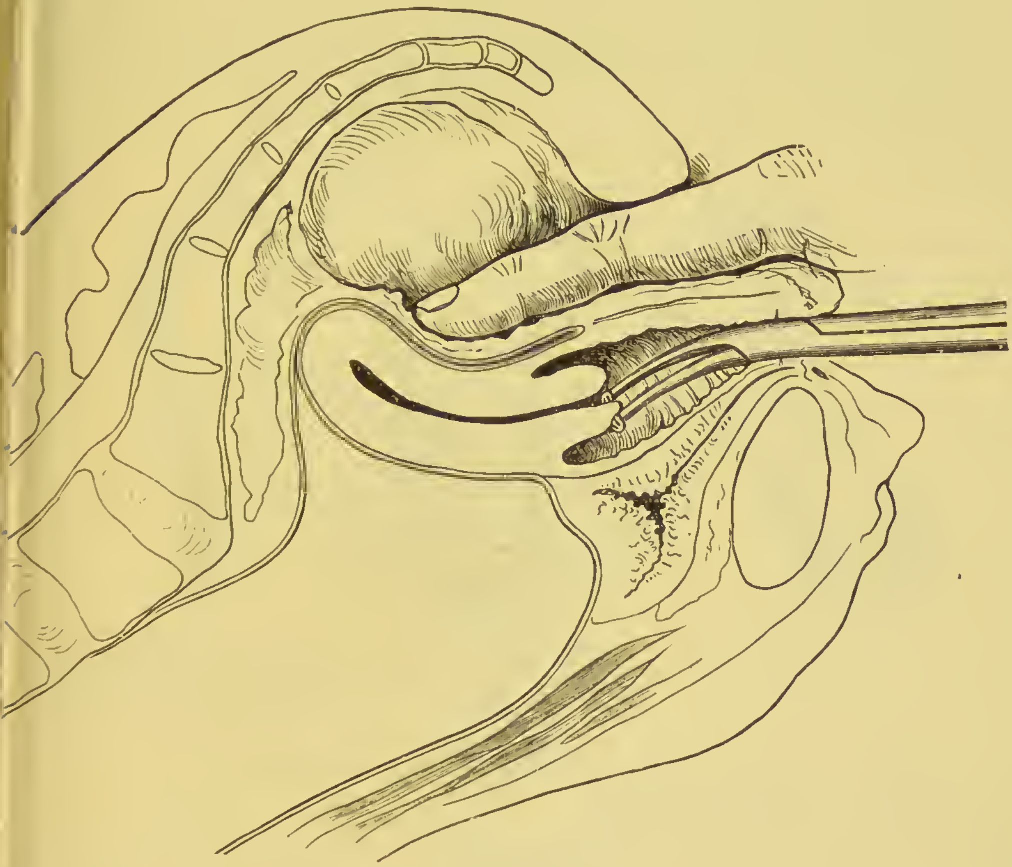

Fig. 191.

Replacement of the Uterus with the Volsella and the Finger in the Rectum; the patient is in the genupectoral position.

Having replaced the uterus by one of these methods, we have to retain it in its normal position.

The retention of the uterus in its normal position is effected by *vaginal pessaries*. Of these the best form is the Hodge or, its modification, the Albert Smith.

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[1] For full account of changes produced by the genupectoral posture, the student should consult the Atlas of the "Relations of the Abdominal and Pelvic Organs in the Female": *Simpson and Hart*, 1881.

Material of Pessaries.

The *material* of which they are made is vulcanite, which is light and smooth and not affected by vaginal discharges. To bend the vulcanite, the pessary should be placed in hot, almost boiling, water. It is thus made pliable and can be moulded to the desired form, but becomes firm again on placing it in cold water; this is also effected by oiling the pessary and heating it in a spirit lamp. Pessaries are also made of gutta-percha, which has the advantage of being easily moulded; these cannot, however, be worn for a long time, as the gutta-percha is absorbent and, retaining the secretions, sets up irritation. The patient can wear one for a few weeks till we see that it fits comfortably and is effective, and then we can substitute one of a similar form made of vulcanite. Celluloid and aluminium pessaries are now sometimes used instead of vulcanite ones.

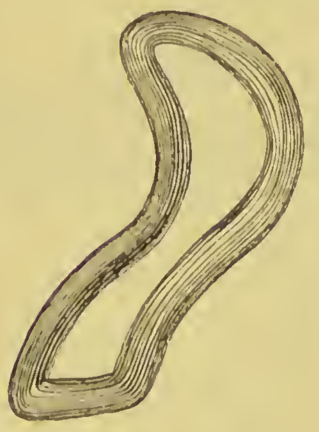
FIG. 192.
HODGE PESSARY.

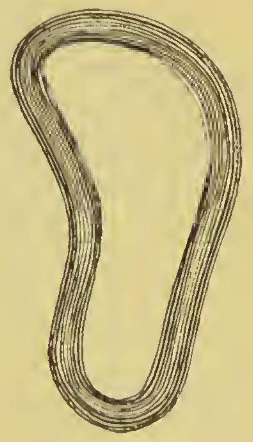
FIG. 193.
ALBERT SMITH PESSARY.

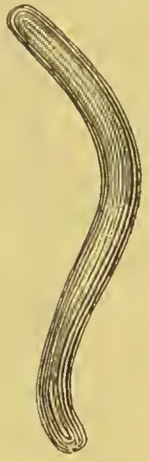
FIG. 194.
SIDE VIEW OF ALBERT SMITH PESSARY. The Hodge is similar, but has the lower curve less marked.

The Hodge Pessary.

The *form* of the Hodge is an elongated horse-shoe, with a straight transverse bar joining the free ends. Seen from the front (fig. 192), it has a curved upper end which is adapted to the posterior fornix; the lower end consists of a straight bar which serves to keep the sides apart, and lies under cover of the symphysis pubis; the external angles of this end are rounded to prevent their cutting the vagina; the sides run almost parallel. Seen from the side (fig. 194), it is a mould of the vaginal slit; there is an upper sacral curve, which is long and well-marked; there is a lower pubic one, which is not necessarily present or is only slightly marked. The pessary lies so that the concavity of the sacral curve looks forward, that is to say, the upper end of the pessary (like the posterior fornix vaginæ) curves forwards.

The Albert Smith Pessary.

The Albert Smith (fig. 193) contracts in its lower half to a more or less beak-shaped end; seen from the side, it has the pubic curve more marked (fig. 194).

Scientifically it is the more correct form, because the posterior wall of the vagina is narrower below than it is above. The lower end should not be too much contracted, otherwise it is apt to interfere with married life; also when the vaginal orifice is wide, it favours the expulsion of the instrument. A second modification of the Hodge is recommended by Thomas, in which the upper bar is thicker, the sacral curve more pronounced, and the whole instrument longer.

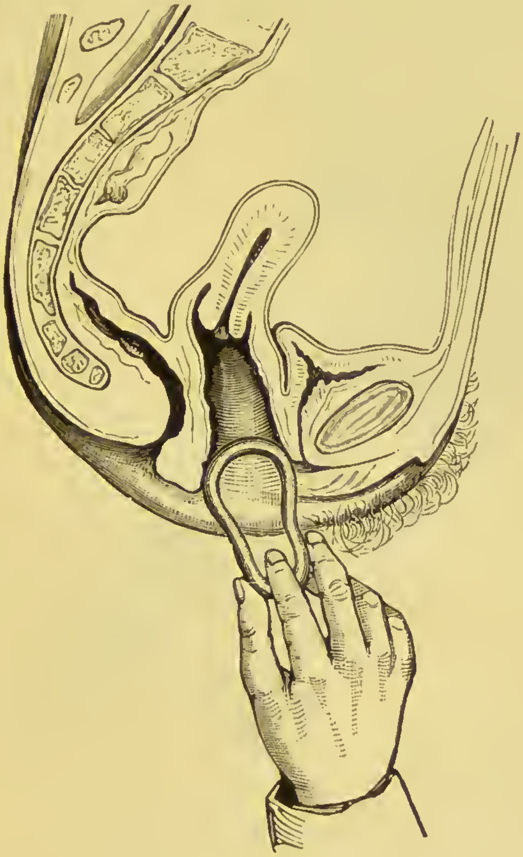

FIG. 195.
INTRODUCTION OF PESSARY, FIRST STAGE.

Choice of Hodge Pessary.

The *choice of an instrument* suitable to the case must be made. The pessary should be narrower and shorter than the posterior vaginal wall, so that it produces no tension when it is in position. The upper bar should be of such a size that it can be passed in easily; the lower should be narrower than the upper, but not too narrow for the reasons given above. The proof of a good fitting instrument is that the patient does not feel its presence, nor should it interfere with married life.

Mode of Introduction of Hodge Pessary.

The *mode of introduction* of the pessary demands special attention. It is important that this apparently simple manœuvre be effected without causing pain to the patient. From the fact that the vulvar orifice is antero-posterior while the cavity of the vagina is transverse, the instrument must be introduced with its plane surface horizontal (the patient is supposed to be on the side) and afterwards rotated so that this comes to be vertical. From the position of the cervix, the instrument is very liable to run into the anterior fornix. When in position the upper end must curve forwards. Having oiled the instrument, grasp it with the lower end (the square end in the case of the Hodge, the narrower end in the case of the Albert Smith) between the finger and thumb of the right hand. Separate the labia with the first and second fingers of the left hand; when the vaginal orifice is narrow, hook back the fourchette with one finger or get the posterior corner of the end which is being introduced within the vaginal orifice; and press back the perineum with it so that the anterior corner is not pushed against the clitoris or vestibule. Now push the pessary backwards in the axis of the vagina till it is half within the cavity (see fig. 195), and rotate it so that the concavity of the sacral curve looks forwards. Pass the index finger behind the instrument into the vagina, and place the tip of it against the upper bar; carry the pessary onwards, keeping

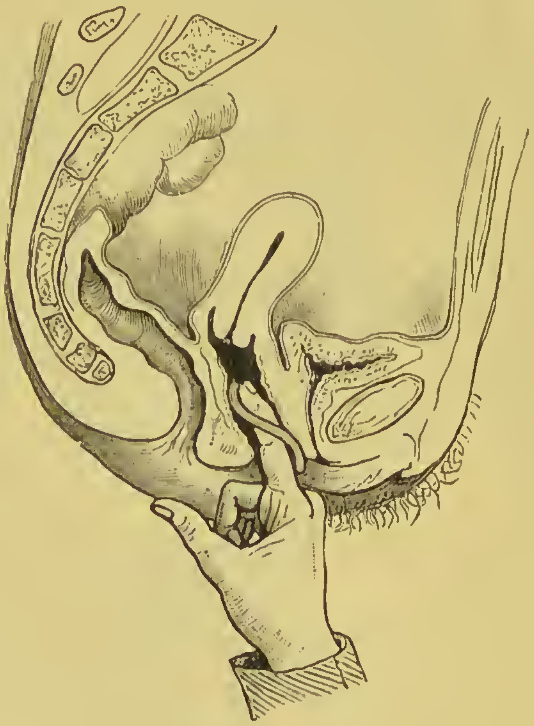

FIG. 196.

SECOND STAGE: PESSARY CARRIED ON BY FINGER.

the upper bar well against the posterior vaginal wall to prevent its slipping up in front of the cervix (fig. 196).

How the Hodge Pessary lies when *in situ*.

The *position* and *action* of the pessary when *in situ* are as follows. It lies exactly adapted to the vaginal walls (fig. 198); the upper end being in the posterior fornix behind the cervix, the lower just within the vaginal orifice. It is kept in position through its resting on the oblique anterior face of the sacral segment of the pelvic floor, against which it is compressed by the posterior face of the pubic segment.

The student will readily understand and remember the position of the pessary in the following way. Hold the hand inclined as in fig. 197, with the palm slightly inflexed. It resembles the posterior vaginal wall in the following points:—(1) It is broader above than below; (2) it curves forwards above; (3) from its obliquity, it allows the pessary to sit on it. Now place the pessary on it. It will only lie adapted to the hand when the broad end is above and the upper curve is directed forwards.

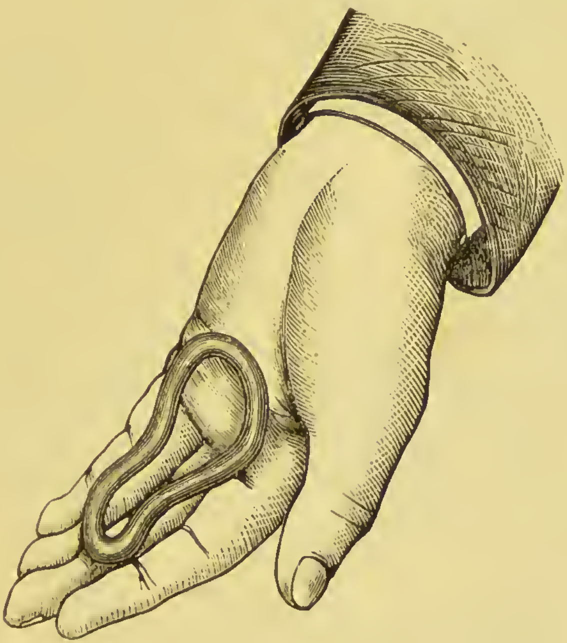

Fig. 197.

Hand holding Albert Smith Pessary.

Action of the Hodge Pessary.

The Hodge pessary does not act as a lever; that is to say, the intra-abdominal pressure does not act specially on the lower bar and depress it, causing the superior one to rise. The intra-abdominal pressure acts nearly equally on both bars, of which fact the student may satisfy himself clinically. Its action is that the *upper bar gives a point d'appui to the posterior fornix.* The posterior vaginal wall runs round the upper bar as on a pulley, and, as it is inserted into the cervix, the latter is thereby drawn upwards and the fundus thrown forwards (fig. 198). The pessary, therefore, has the same action as the utero-sacral ligaments, if we suppose that these keep the cervix backwards. This is only the action in the case of a retroverted uterus which has been replaced. A vaginal pessary, however, gives relief even though we may not be able to replace the uterus. In this case we may suppose that it acts by supporting the uterus as a whole, thus diminishing tension on the ligaments and passive congestion.[1]

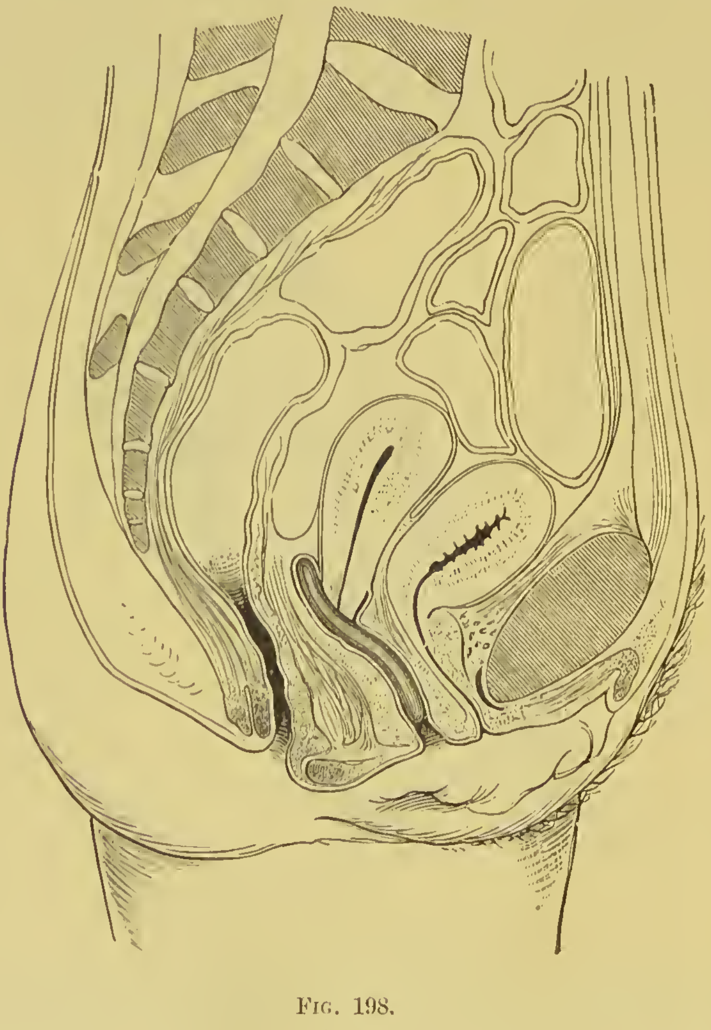

Fig. 198.
Position and Action of Pessary.

The after watching of the case is important. The patient should be instructed to return in two days to see that the instrument is in place, and to return at once if it causes pain. After this she should report herself occasionally, say at intervals of a month, when examination is made to ascertain that the uterus keeps its place. If she uses hot water injections occasionally, it is not necessary to remove the instrument to clean it more frequently than this. After the pessary has been worn for some months, it may be removed to see if the uterus remains in position without it. Sometimes we find that the uterus falls back again into its abnormal position as soon as the instrument is withdrawn; in such a case, it must be introduced again, and may have to be worn for years. Should conception occur, the pessary may be worn till the fourth month, after which the uterus rises above the brim and there is no longer reason to fear displacement.

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[1] See Granville Bantock on *The Use and Abuse of Pessaries*, London, 1884; Hart on *The Structural Anatomy of the Female Pelvic Floor.*

Schultze's Pessary.

In Germany, Schultze's pessary (fig. 199) is the one in general use. It has the form of a figure of eight, the upper ring embracing the cervix. It is interesting to note that it also goes on the principle that the pessary acts on the cervix, not the body of the uterus.

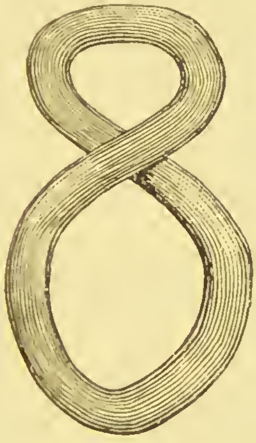

Fig. 199.
Schultze's Pessary.

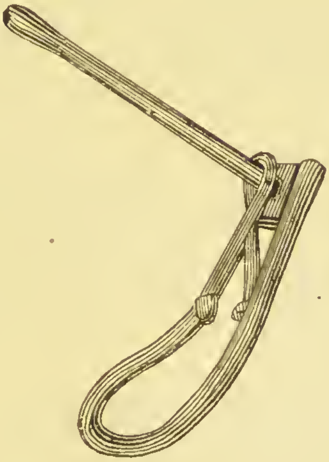

Fig. 200.
Meadow's Compound Stem Pessary.

In some cases the uterine tissue is flaccid at the angle of flexion, and the body falls to the back or front as if it were jointed to the cervix. Here the Hodge, which acts on the body through the cervix, does no good; the intra-uterine stem, along with a Hodge which has transverse bars, is suitable for some of these cases. Wynn Williams, Meadows (fig. 200), and Routh have devised various forms of pessary on this principle. The general opinion of gynecologists in this country is against intra-uterine stem pessaries.

Hodge's Pessary good only in Retroversion.

From what has been said on the action of the Hodge pessary, it is evident that in the treatment of Retroversion + Retroflexion *the version alone is affected by the pessary.* Whether the flexion is remedied will depend on the state of the uterine walls and the effect of intra-abdominal pressure upon them.

For illustrative examples showing the value of pessaries in suitable cases, the student may consult Bantock's monograph, or Macan's translation of Schultze.

Operations for Backward Displacements.

3. *The Operative Treatment of Retroversion and Retroflexion.*—There is probably no subject in operative gynecology on which so much has been written during the last ten years as the above, unless it be the extirpation of the uterus for fibroids or malignant disease. While the latter operation is of the first importance, as it implies the saving of life, the value of the former is more difficult to estimate as it concerns the relief of suffering into which the personal equation largely enters. The causal connection between the displacement and the symptoms is in many cases open to question (*see* p. 360). That benefit follows an operation does not prove that the displacement was the cause, as it might be accounted for in another way, *e.g.*, by the psychical effect of the operation. It is just in operations done to relieve reflex pains that there is most room for this effect. They have this advantage, however, that they set the patient free from the necessity of wearing a pessary.

Three methods of fixing the replaced uterus have been employed, which may be described as vaginal fixation, ventral fixation, and shortening or fixation of the round ligaments.

Vaginal Fixation.

1. *Vaginal fixation*[1] includes all operations which aim at fixing the cervix or body of the uterus to the vagina. This has been tried in various ways.

By excising a portion of the anterior wall of the cervix Von Rabenau[2] hoped, from the consequent contraction, to effect a permanent anteflexion. Conversely by amputation of the posterior lip of the cervix and stitching the stump to the posterior vaginal wall, Richelot[3] sought to produce anteversion. To excite adhesions in the utero-vesical pouch of the peritoneum, and thus tack the uterus forward to the bladder, Schücking[4] passed a suture through the anterior wall of the uterus, the utero-vesical peritoneum, and the anterior fornix. The ligature was introduced with a curved needle from the uterine cavity which required to be previously dilated. The risk of injuring the bladder or intestine in this operation led Zweifel[5] to modify it by opening into the utero-vesical pouch, and Sänger[6] to stitch the fundus directly to the anterior fornix.

The term vaginal fixation is now applied to those cases in which the anterior surface of the uterus is stitched to the anterior vaginal wall or to the peritoneum covering the bladder. As the sutures are removed or absorbed there is no direct union but simply through adhesions.

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[1] The term vagino-fixation though shorter is incorrect. Called also vaginal-hysteropexy, colpo-hysteropexy.

[2] Ueber eine neue operative Behandlung der Retroflexio Uteri: Cent. f. Gyn., 1886, S. 429. Six cases are recorded, but the ultimate result is not given. Schmitt proposed a similar operation. Cent. f. Gyn., 1888, S. 685.

[3] De l'hystéropexie vaginale: Union Medicale, Dec. 1889.

[4] Eine neue Methode der radicale Heilung der Retroflexio Uteri: Cent. f. Gyn., 1888, S. 181 and 682. Also *ibid.*, 1890, S. 123, and 1891, S. 249. He has operated on 217 cases, 88 of which have been followed, with failure only in 4. The suture is not removed for six weeks, and a pessary is worn for twelve. 23 of his cases were subsequently delivered at term.

[5] Ueber die Vaginalfixatio Uteri: Cent. f. Gyn. 1890, S. 689.

[6] Cent. f. Gyn., 1888, S. 17 and 34.

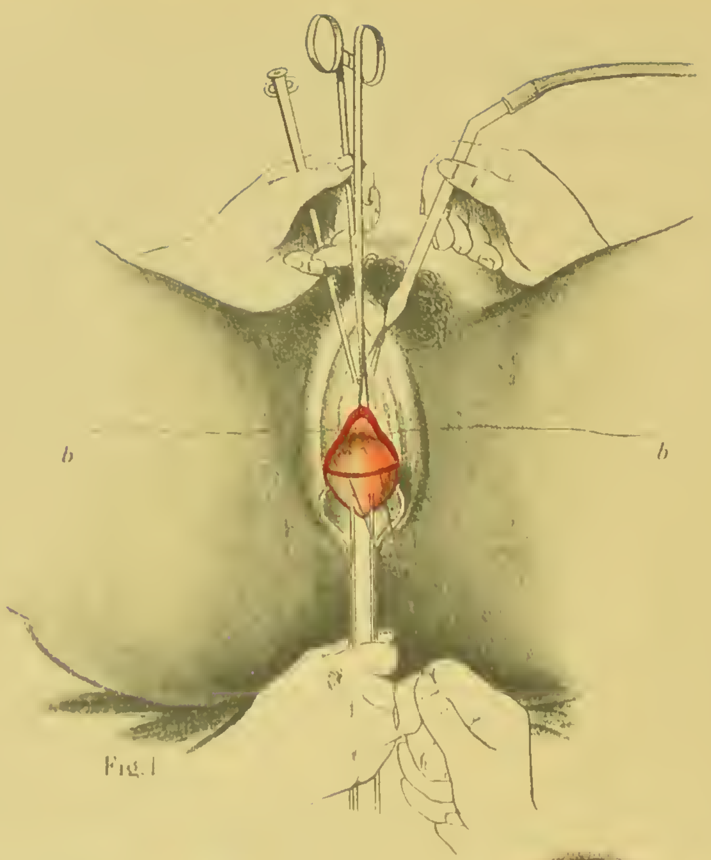

Fig. 1

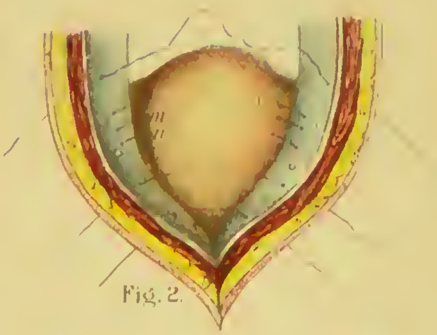

Fig. 2.

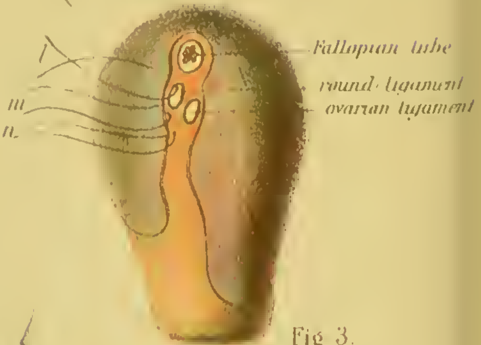

Fig 3.

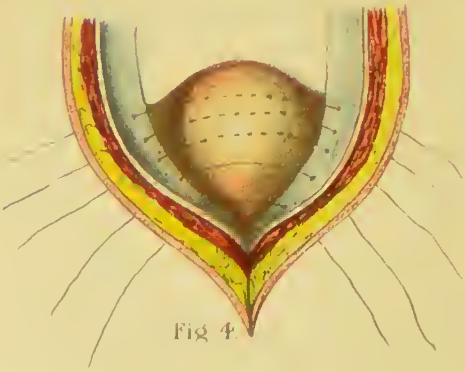

Fig 4.

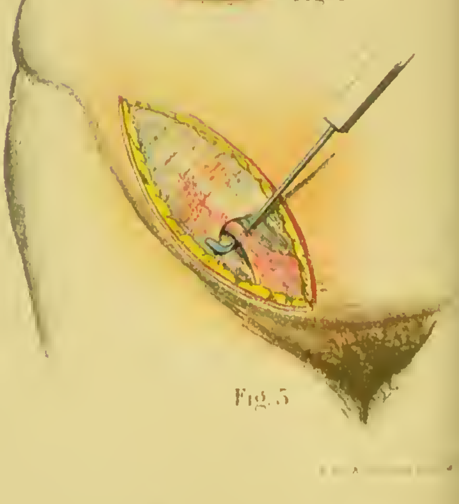

Fig. 5

OPERATIVE TREATMENT OF BACKWARD DISPLACEMENTS.

FIG. 1. Vaginal fixation ; *(Dührssen).*
FIG. 2. Indirect ventral fixation ; FIG. 3. Position of uterine sutures (*Olshausen*).
FIG. 4. Direct ventral fixation (*Leopold*).
FIG. 5. Dissection for Alexander-Adams operation.

With these operations the names of Mackenrodt and Dührssen are associated.

Mackenrodt first described his operations at the Berlin Obstetrical Society in May 1892,[1] but has since modified his procedure. He now operates as follows :—

Mackenrodt's Operation.

An elliptical incision is made in the anterior vaginal wall as for colporrhaphy, and the included portion of the mucosa dissected off. The lower edge of the bladder is defined and raised up by blunt dissection until the utero-vesical pouch is reached, which is opened into transversely. The peritoneum over the bladder is now grasped and drawn downwards. The fundus if retroverted is anteverted by pushing the cervix backwards until the anterior surface of the uterus can be grasped with volsellæ. The vesical peritoneum, which has been drawn down, is now stitched to the anterior surface of the uterus by a continuous suture running transversely at the level of the insertion of the round ligaments. Great care is required in suturing the peritoneum not to include the bladder wall.

From the foregoing description it will be evident that Mackenrodt's operation is a *vesico-fixation*, the uterus being fixed to the peritoneum over the bladder. The advantage claimed for this is that while adhesions are formed sufficient to keep the uterus in position, they are not strong enough to affect its expansion in pregnancy or the changes in labour.

Dührssen[2] described his operation about the same time, and has since published an important monograph[3] describing subsequent modifications of his technique, and giving tables of 359 cases.

Dührssen's Operation.

He makes a transverse incision in the anterior fornix at the base of the cervix, 3 to 4 cm. long, from which a mesial one is carried towards the urethral orifice for the same length, and the upper end of this incision siezed in volsella (Pl. X., fig. 1). The utero-vesical peritoneum is reached by blunt dissection and opened into sagittally. A thin catgut suture is passed through the peritoneal margin at the upper end and also at each side to prevent its retraction. Through the opening thus made various operations on the appendages are performed, but for vaginal-fixation of the uterus a silkworm gut suture (Pl. X., fig. 1 *b b*) is passed through the vaginal wall and peritoneum on the one side, carried through the anterior wall of the uterus at the level of the insertion of the Fallopian tubes, and through the margins of the peritoneal and vaginal incision on the other side. This suture is not tied until the peritoneal wound is closed, which is done by a continuous, buried catgut suture. The wound in the vaginal wall is closed separately. *The silkworm gut fixation suture is left in for six weeks, and then removed.*[4]

Dührssen claims that in his operation the adhesions are firmer and keep the uterus better in position. He gives the results of 359 vaginal fixations, with only $2{\cdot}3^{\circ}/_{\circ}$ failures. Of these, twenty were followed through a subsequent confinement, and in only two was assistance called for. The opinion and results of other operators are not so favourable. The fixation of the uterus causes a tendency to abortion,[5] and to difficulties in labour, which must be taken into account in estimating the value of these operations.[1]

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[1] Die Therapie der Retroflexio Uteri : Cent. f. Gyn., 1892, S. 479.

[2] Ueber Vagino-fixation Uteri : Zeits. f. Geb. u. Gyn., 1892, Band XXIV., S. 368.

[3] Die Einschränkung des Bauchschnitts durch die Vaginale Laparotomie : Karger, Berlin, 1899.

[4] M'Cann uses a series of silkworm gut sutures, which are removed in fourteen days. He reports twenty cases of operation : Brit. Med. Jour., 1902, Vol. II., p. 1156.

[5] Thus Straussman mentions six abortions in twenty-four pregnancies, and Weberstedt recorded a like proportion in Gusserow's clinique, while Negri found nineteen abortions from seventy-seven cases.

Ventral Fixation.

2. Under *ventral fixation*,[2] we include various operations which have the object of causing union by adhesions between the uterus and the anterior abdominal wall.

Methods.

To avoid opening into the peritoneal cavity, the uterus has been pushed up from below against the abdominal wall, and transfixed there by a suture passed through the latter. The risk of transfixing intestine at the same time is obvious, and this blind method of procedure has not found many advocates.

The usual method, however, is to open the abdomen and stitch the uterus, either indirectly by means of its broad ligaments (Pl. X., figs. 2 and 3), or directly by sutures passed through its substance (Pl. X. fig. 4) to the abdominal incision.

In the direct method the uterus may be stitched to the abdominal wall by catgut sutures, uniting the superficial tissue of the margins of the uterus to the peritoneum and subjacent tissue of the abdominal wall; the abdominal wound being subsequently closed in the usual manner. Or the sutures used to close the wound may be passed likewise through the anterior surface of the uterus. To cut off infection from the skin, the sutures which pass through the uterine wall may stop short of the skin, and thus be buried when the abdominal incision is closed. Further, instead of passing straight through the anterior surface of the uterus, they may pass out and in upon its peritoneal aspect, so as to excite adhesions over the whole breadth of the uterus, and keep it in apposition with the abdominal wall. To promote adhesion, the peritoneal surface of the uterus may be scarified.

We consider now these methods of *ventral fixation* more in detail.

The various modes of suturing the uterus to the wall of the abdomen *without opening the latter*, are worthy only of passing notice. Kelly[3] recommended lifting the uterus upwards by the hand in the vagina until it could be felt through the abdominal wall just above the pubes, and transfixing the wall and fundus uteri with a ligature which was left in for a fortnight. So also Shober[4] has pushed up the uterus with a canula in the uterine cavity through which a needle was passed, and the uterus stitched to the abdominal wall. An abdominal incision through the superficial fascia was made as a preliminary, in the bottom of which the uterine ligature was tied so as to bury it. Further, Foerster[5] incised the pouch of Douglas, brought the uterus out, scarified and transfixed the fundus by two silk threads which were subsequently carried by a canula and needle through the abdominal cavity and abdominal wall.

These methods of tacking the uterus to the abdominal wall in the dark hardly merit the name of operations, but the stitching of the uterus indirectly by means of its broad ligaments, or directly to the abdominal wall, deserves fuller consideration. It was a natural enough experiment when the appendages were removed in cases of retroversion, to stitch the pedicles into the abdominal incision[1] as was first done by Koeberlé (1869), and Sims (1875).

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[1] Rühl states that in only three cases out of seventy-one labours after vaginal fixation was there any trouble, and that of the nine published cases calling for Cæsarean section in only two was the operation necessitated by the result of the fixation: Monats. f. Geb. u. Gyn., Bd. XIV., Hft. 4.

[2] Called also ventro-fixation, ventri-fixation, gastro-hysteropexy.

[3] Amer. Journ. Obstet., 1889, p. 1066.

[4] Amer. Journ. Obstet., 1895, p. 843.

[5] The Surgical Treatment of Retrodisplacement of the Uterus, with special reference to Vaginal- and Ventro-fixation. Amer. Journ. Obstet., 1895, Vol. I., p. 747.

Ventral Fixation.

The stitching of the broad ligament to the abdominal wall, apart from amputation of the appendages, as a treatment for retroflexion, was first devised by Olshausen,[2] and constitutes the *indirect* method.

Indirect Method.

He united with silk the round and broad ligaments at the upper angle of the uterus (Pl. X., fig. 3) to the abdominal wall.

It will be noted that in this operation the three sutures (l m n) which unite the angle of the uterus to the parietal peritoneum, are distinct from those which close the abdominal incision, and are of course not removed, but left to be absorbed (Pl. X., fig. 2). Care is required in introducing them not to pierce the Fallopian tube (*v.* Pl. X., fig. 3) or hypogastric artery in the abdominal wall. Instead of suturing the broad ligament by its anterior aspect, Kelly[3] has stitched the ovarian ligament to the abdominal wall, which he thinks produces more complete anteversion of the uterus.

Direct Method.

Fixation of the uterus *directly* to the abdominal wall is done by Leopold in the following way.[4]

He passes three of the sutures which close the abdominal incision, also through the anterior surface of the uterus (Pl. X., fig. 4). These dip into its superficial tissue for about one-third of an inch, and they run opposite to the insertion of the Fallopian tube, of the round ligament, and the third still lower down. The area of the uterus within the sutures is scraped with the back of the bistoury, but not enough to make it bleed. The sutures are removed in a fortnight. A Hodge pessary is worn for a month. Czerny[5] modifies this procedure in that the sutures which fix the uterus do not penetrate as far as the skin surface of the abdomen, and are of catgut. Terrier[6] makes the uterine sutures pass out and in on the peritoneal surface of the uterus so as to promote peritonitic adhesion to the abdominal wall.

Hirst[7] passes the suspensory suture through the uterus at the fundus and includes a portion of the rectus muscle in the loop, so as to secure a firmer hold of the abdominal wall.

Kelly[8] stitches the posterior surface of the fundus to the abdominal wall, so as to bring the uterus into a decided anteflexion. In this position intra-abdominal pressure increases the anteflexion, and does not tend to force the uterus away from its new attachments.

The peritoneum and sub-peritoneal tissues are transfixed about half an inch from the abdominal incision, the suture being carried through the posterior wall of the uterus about half an inch below the fundus, and then through the peritoneum on the opposite side of the incision. A second suture is passed in a similar way about half an inch higher up. These sutures are tied within the peritoneal cavity, the incision in which is closed in the usual way.

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[1] In addition to stitching the pedicle in the abdominal incision, Klotz passed a glass tube behind the uterus into the pouch of Douglas, the presence of which he thinks excites adhesions and favours fixation. See Cent. f. Gyn., 1888, S. 11, and 1891, S. 97, where he records thirty-eight cases treated in this manner.

[2] Ueber ventrale Operationem bei Lageanomalien: Cent. f. Gyn., 1886, S. 667 and 698.

[3] Amer. Jour. Obst., 1889, p, 1066. Peterson records seventeen cases done by Kelly's method. He used both silk and catgut, and carried the suture deeply into the muscles and fascia of the abdominal wall. "Suspension of the Retro-displaced Uterus by the Utero-ovarian ligaments"—with interesting discussion. Amer. Jour. Obstet., June 1895, Vol. I., p. 832.

[4] Cent. f. Gyn., 1888, S. 161, and 1890, S. 185. Also Sammlung klinischer Vorträge, No. 333.

[5] Beitr. zur klin. Chirurgie, 1888, Bd. IV., Hft. 1, S. 179.

[6] Dumoret—Laparo-hystéropexie, etc. Thèse de Paris, 1889.

[7] Diseases of Women: Saunders, Philadelphia, 1903, p. 290.

[8] Operative Gynecology, Vol. II., p. 149.

In two cases in which abdominal section was done subsequently for another reason, the uterus was found lying anteverted, and connected to the anterior abdominal wall with two separate slender bands produced by stretching of the adhesions which had formed about the sutures. As regards the effect on subsequent pregnancy, forty-nine married women had reported within one or two years after operation fourteen pregnancies, of which nine were normal. Of the others, two had abdominal pain during gestation, one miscarried, and in two the placenta was retained. As regards relief of symptoms, twenty-seven were completely relieved, thirty-seven greatly benefited, and eleven unrelieved.

Effect on Pregnancy and Labour.

Other operators have also found that ventral fixation caused disturbance in subsequent pregnancy and labour. Thus Milander[1] collected seventy-four cases; of the sixty-three who had been confined, fifty-four went to full time, while six aborted, and three had premature labour. Eleven of the labours required assistance, two being delivered by Caesarean section. Küstner[2] gives the result in one hundred and twenty-two cases: seventy-four went to full time, while operative interference was called for in many cases. Noble[3] collected the results of eight hundred and eight operations in America, and found that in seventy-six pregnancies there were four abortions and three deaths, only one of these being due to the fixation. But Dickson[4] has more recently recorded a case where rupture of the uterus occurred during labour, and Lapthorn Smith[5] found that after ventral fixation thirty per cent. (thirty-six out of one hundred and thirty-eight) had severe pain, miscarriage, or difficult labour.

Alexander-Adams' Operation.

3. *Shortening and fixation of the round ligaments.*—As the round ligaments are the natural means by which the uterus is kept to the front, the operations which aim at contracting or fixing these ligaments have received more attention, especially since the results of keeping the uterus in position by artificial adhesions have not been found satisfactory. This may be done by cutting down on the ligaments as they emerge from the external abdominal ring. The round ligaments may also be shortened by stitching them within the abdominal cavity, in the course of an abdominal section. It may also be done per vaginam, the ligaments being got at through the anterior fornix by a vaginal cœliotomy, as in Dührssen's operation. We shall describe the various

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[1] Ventrifixation des Uterus; Schwangerschaft und Querlage des Kindes: Zeitschr. f. Geb. u. Gyn. Bd. XXXIII., S. 464.

[2] Volkmann's Sam. klin. Vorträge, No. 171, Dec. 1896.

[3] Trans. Amer. Gyn. Soc., 1896, p. 271.

[4] Am. Jour. Obst., 1901, Vol. II., p. 34.

[5] Am. Jour. Obst., 1898, Vol. II., p. 66.

methods according as the round ligament is got at, (*a*) at the external abdominal ring, (*b*) by abdominal section, (*c*) through the vagina.

(*a*) *At the external abdominal ring.*—Shortening of the round ligaments in this situation is an operation first proposed by Alquié,[1] but is usually called the Alexander-Adams, after the two British operators who re-introduced and elaborated it. Through its not having the risk of abdominal section, and thus being a minor rather than a major operation, it has been for a long time increasingly popular.

The technique of Alexander-Adams[2] operation is, shortly, as follows.

The pubic hair having been shaved and the skin cleansed, the pubic spine is felt for on both sides, and an incision (Pl. X., fig. 5) from 1½ to 2 in. long, according to the fatness of the patient, made from it outwards parallel with Poupart's ligament. The superficial fascia is divided until the pillars of the ring are recognised. In cutting through the fibres between these some delicate fat protrudes. On hooking this up with an aneurism needle (Pl. X., fig. 5) the ligament is seen as a red cord. The inguinal nerve should be cut and fascia cleared from it anteriorly. If the ligament be not recognisable at the external ring, the canal can be slit up to the internal. The ligament when found on the one side is caught in forceps, and an antiseptic tampon placed on the wound; the ligament on the other side is found in the same way.

The uterus is now replaced by an assistant, with the sound, and the ligaments drawn out from 2 to 4 inches. Each is then sewn to one or both of the pillars by catgut suture, and the piece of free ligament cut away. The wounds are closed with two or three sutures.

Alexander now uses a single silkworm gut suture which passes through the skin and is removed at the end of the second week. He has operated in 400 cases, and gives the results of 69 cases which have been followed for some time subsequently, with satisfactory results.

In America the Alexander-Adams operation has been recently advocated by Cleveland,[3] Edebohls,[4] and Goldspohn,[5] and on the continent by Delagénière[6] and Veit[7]: while in a discussion before the British Gynecological Society in 1901 the preference was given to this operation.

(*b*) *Within the abdominal cavity.*—Shortening of the round ligaments within the abdominal cavity was recommended by Bode,[8] Wylie,[9] and Dudley.[10] The best method of doing this is to fold the round ligament on itself near its insertion into the horn of the uterus, and fix the loop in position with three catgut sutures (fig. 201). The opposed portions of the ligament should be scraped beforehand, so as to cause firm adhesion. We prefer this method of shortening the ligaments to the

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[1] Alquié presented to the Académie de Médecine in 1840, a memoir, "Sur une nouvelle méthode pour traiter les divers déplacements de la matrice," which had not been published until it appeared in a recent monograph by Moreau, "Du raccourcissement des ligaments ronds appliqué à la guérison des déplacements de la matrice." Bruxelles, 1894.

[2] W. Alexander—Practical Gynecology, with fifteen years' experience of the Operation of shortening the Round Ligaments: Edinburgh, 1899.

[3] Am. Journ. Obst., 1894, Vol. II., p. 297, with report on 65 cases.

[4] New York Medical Journal, October, 1890.

[5] Am. Journ. Obst., 1900, Vol. I., p. 586.

[6] Comptes Rend. du Cong. Interm., etc., Amsterdam, 1900.

[7] Berlin Klin. Woch., June 1900.

[8] Zent. f. Gyn., 1889, S. 33.

[9] Am. Journ. Obst., 1889, p. 478.

[10] Am. Journ. Obst., 1890, p. 1336.

Alexander-Adams operation, because the ligament is got at where it is well developed. Where abdominal section has to be done to separate adhesions, it will be found one of the most efficient means of keeping the uterus in position.

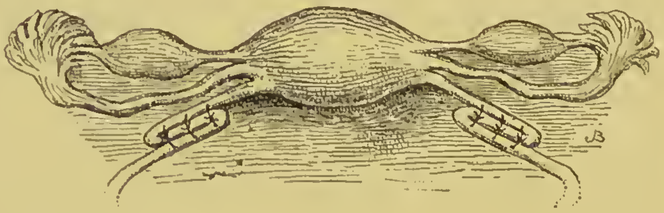

FIG. 201.
INTRA-PERITONEAL SHORTENING OF THE ROUND LIGAMENTS.

(*c*) *Through the vagina.*—The round ligaments may also be got at through the anterior fornix, drawn down to the vaginal incision and fixed there. Wertheim[1] of Vienna and Vineberg[2] of New York described a similar operation about the same time.

The uterus is exposed as in the operation for vaginal fixation, and two silkworm gut sutures passed through the round ligament near its insertion into the uterus, and then carried through the margin of the vaginal flap, and tied loosely in the vagina: the peritoneal and vaginal wounds are then closed. The round ligament suture is removed after twelve days.

Vineberg gives the results[3] of 50 cases treated by this method, with satisfactory results in 47 as regards the displacement, while three had had pregnancies and normal labours.

As regards the relative merits of these various operative methods of dealing with the retroverted uterus we are not yet in a position to give a final opinion. Each method at present has its advocates, and time alone will show which will hold the day. The shortening of the round ligaments, by which the uterus is naturally kept to the front, is a more rational method than the production of adhesions, and less likely to interfere with the function of the uterus in pregnancy and labour.

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[1] Zent. f. Gyn., 1898, S. 25, 265. (With four cases).
[2] Medical News, New York, March 1896, where he describes the first case of this operation.
[3] Am. Jour. Obst., 1900, Vol. II., p. 168.

CHAPTER XXXIV.

INVERSION OF UTERUS.

LITERATURE.

Atthill—Inversion of uterus due to fibroid tumour: Dublin Medical Journal, Feb. 1879. *Aveling*—On Inversion of the Uterus: Brit. Med. Journ., 1886, I., p. 475. *Barnes*—Diseases of Women: London, 1878, p. 721. Med. Chir. Trans., 1869. *Crosse*—An Essay, literary and practical, on Inversio Uteri: Trans. Provincial Med. and Sur. Assoc., London, 1845. *Duncan, Matthews*—On the Production of Inverted Uterus: Edin. Med. Jour., May, 1867. *Emmet*—Principles and Practice of Gynæcology: Churchill, London, 1884, p. 406. *Fritsch*—Die Lageveränderungen der Gebärmutter: Billroth's Handbuch für Frauenkrankheiten: Stuttgart, 1881. *Küstner*—Lagè und Bewegungsanomalien des Uterus, etc., Veit's Handbuch der Gyn.: Wiesbaden, 1897. *M'Clintock*—Diseases of Women: Dublin, 1863, p. 76. *Macdonald*—Two cases of chronic inversion of the uterus: Edin. Obst. Trans., Vol. vi., p. 170. *Malins*—Chronic Inversion of the Uterus: Allbutt and Playfair's System of Gynecology, London, 1896. *Spiegelberg*—Zu den Inversionen der Gebärmutter: Archiv f. Gyn., B. iv., S. 350, and B. v., S. 118. *Thomas*—Diseases of Women, p. 453: Philadelphia, 1880. *Wallgren*—Zur Kenntniss der Inversio Uteri: Arch. f. Gyn., 1901, Vol. lxiii., S. 606. Wallgren's article gives the recent literature on the operative treatment. *Werth*—Ueber partielle Inversion des Uterus durch Geschwülste: Archiv f. Gyn., Bd. xxii., S. 65. The essay by Crosse gives the fullest anatomical description of inversion.

PATHOLOGY.

IN inversion, the uterus is turned inside out, so as to form a polypoidal projection into the vagina: its peritoneal surface is converted into a cup-shaped hollow; its mucous membrane becomes *everted* so as to lie exposed on all sides in the cervix and vagina.

The mechanism by which this condition is brought about is the following.

1. A portion of the muscular wall of the uterus *having lost its tone*, becomes depressed towards the uterine cavity. In the puerperal condition this is usually that portion of the wall to which the placenta has been attached, and the condition has been described by Rokitansky as "paralysis of the placental seat"; this partial inversion will be frequently found on abdominal palpation in cases of post-partum hæmorrhage (*Fritsch*). In cases of tumour-growth, fatty degeneration (*Scanzoni*) or malignant infiltration (*A. R. Simpson*) weakens the wall

of the uterus round the base of the growth, and thus produces an analogous condition.

2. *Muscular contractions* of the non-depressed portion of the uterus, combined with *intra-abdominal pressure*, carry the depressed portion further into the uterine cavity, until the fundus reaches the os internum (fig. 209). In the puerperal condition, muscular contractions occur spontaneously, or are excited by the presence of the placenta; in the case of a polypoidal tumour, they are due to the presence of the foreign body. *Traction from below*, such as the pulling away of the placenta or the tension on the pedicle of a polypus which is being extruded, also produces inversion.

3. The fundus of the uterus, by continuation of the same process, dilates the cervical canal and is "born" into the vagina (fig. 206).

In some cases inversion seems to take place from below upwards with a mechanism similar to that of prolapsus uteri, the lower part of the body of the uterus becoming inverted into the cervical canal (*Taylor*).

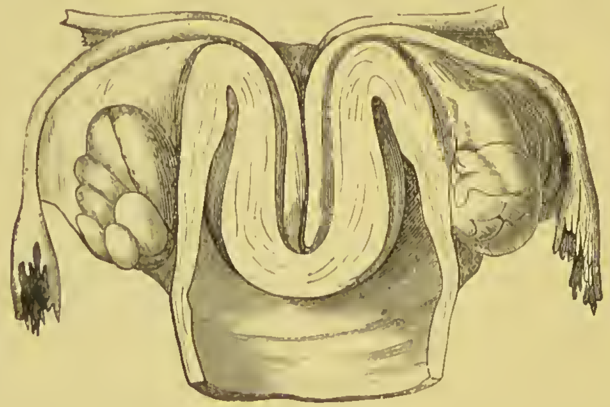

FIG. 202.

INVERSION OF UTERUS (half-size, *Barnes* from *Crosse's* essay). The fundus lies in the vagina; the cervix is not inverted; the lips are seen as a flattened out swelling below the angle of inversion. The ovaries (seen from behind) are not in the peritoneal cup.

Varieties of Inversion.

Matthews Duncan, whose paper was a valuable contribution towards establishing the correct theory of inversion, distinguishes between active and passive inversion. The active is that described above; the passive is produced by inertia of the whole uterus, in which the organ is driven down entirely by intra-abdominal pressure or by traction from below—and not by uterine contractions.

It is evident that the process may become arrested at any of these stages and persist as a permanent condition. When it has persisted for a few weeks, it constitutes "chronic inversion"; this is found in the following forms. (1.) Inversion of one horn only, is a rare occurrence. Slight inversion of the uterine wall, at the base of a polypoidal growth has been more frequently observed. (2.) Partial inversion, when the undus has descended as far as the os internum, is also found as a hronic condition. (3.) Complete inversion of the body of the uterus is he condition most frequently met with.

Anatomy of Inversion.

An exact knowledge of the relation of parts in *complete inversion* is ecessary for diagnosis and treatment. This can only be gained by tudying the inverted uterus as seen in section (fig. 202). We must tudy the position of—

The body of the uterus,
The cervix uteri,
The Fallopian tubes and ovaries,
The peritoneum,
The bladder.

The body of the uterus. The inversion extends, in simple uncompliated cases, as far as the os externum, but *no further.* The uterus lies artly in the vagina, partly in the cervical canal. Its neck is embraced y the os externum, which may lie loosely on it (favouring hæmorrhage) r constrict it firmly (favouring gangrene). After involution takes lace, it becomes small, rounded, and of firm consistence, closely esembling a pedunculated fibroid tumour; and it has been amputated y mistake for such. It has a rounded form, is of a softer consistence nd deeper red colour than a pedunculated fibroid, and has a smooth and slippery surface which bleeds freely when handled. The softness may e so marked that the uterus moulds itself to the vaginal cavity and, ecoming flattened against the posterior vaginal wall, takes on a mushroom-like form (*Freund*).

The mucous membrane of the uterus may undergo all the changes of any tumour with a constricted base and exposed surface. It is usually ongested and bleeds easily; it may become ulcerated and even gangrenous, or may be hypertrophied with polypoidal formations; it may lose its single layer of cubical epithelium and develop a stratified squamous epithelium. The occurrence of these changes has an important bearing on the necessity of replacing the organ.

The cervix uteri. This is rarely[1] displaced in simple uncomplicated inversion; it forms a broad ring embracing the neck of the tumour. Sometimes the inversion is complicated with prolapsus, or, more properly, the vagina also becomes inverted and the inverted uterus caps the inverted vagina (fig. 203). When this occurs, the cervix uteri is also more or less inverted; a part remains just above the os externum, as a depressed ring which also disappears on making traction on the uterus (*Fritsch*).

The Fallopian tubes and ovaries, with some coils of small intestine, may (at first) lie within the inverted cup, which is lined with *peritoneum ;* afterwards they retract out of it. In long-standing cases, the rim of the peritoneal cup is contracted by the muscular fibre of the cervix so as scarcely to admit a finger (fig. 204).

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[1] Crosse figures one preparation in which the cervix as well as the body of the uterus was inverted although there was no prolapsus.

Adhesions rarely form between the *peritoneal surfaces ;* this is an interesting fact and is of importance in regard to replacement. We might have expected detachment of the peritoneal lining or tearing of it by the sudden dislocation ; the previous stretching of it during pregnancy is perhaps the reason why this has not been noticed. Fritsch says that the lifting up of the fornices by the tumour in the vagina, diminishes the strain on the peritoneum.

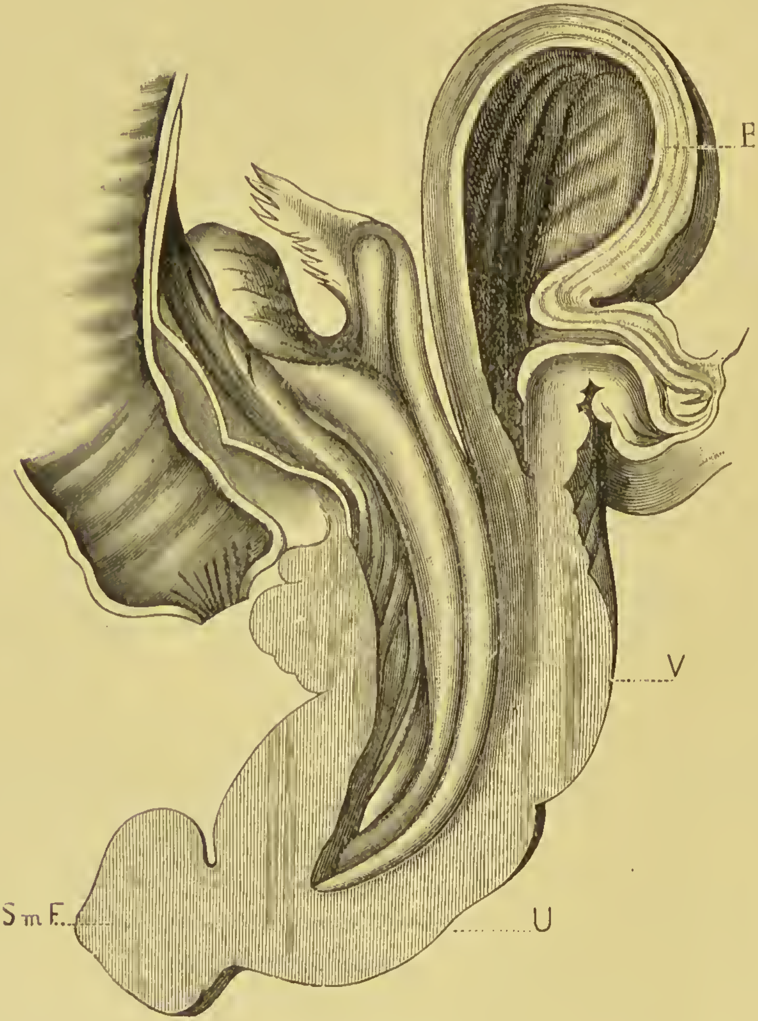

FIG. 203.

INVERSION OF UTERUS + INVERSION OF VAGINA, occasioned by a small submucous fibroid (*M'Clintock*). *Sm F*, submucous fibroid ; *U* uterus, *V* vagina, *B* bladder.

The bladder, from its relation to the cervix (*v.* Chap. IV.), is not altered in position unless there is prolapsus. When the latter occurs, there is cystocele (*v.* fig. 203). We may therefore contrast the two types of inversion as follows.

Inversion of uterus—cervix and bladder normal in position.

Inversion of uterus + prolapsus (*i.e.*, inversion of vagina) — cervix inverted and cystocele.

ETIOLOGY AND FREQUENCY.

Inversion arises under two different conditions :—

1. In the puerperium—puerperal inversion ;
2. Secondary to intra-uterine tumours growing from the fundus.

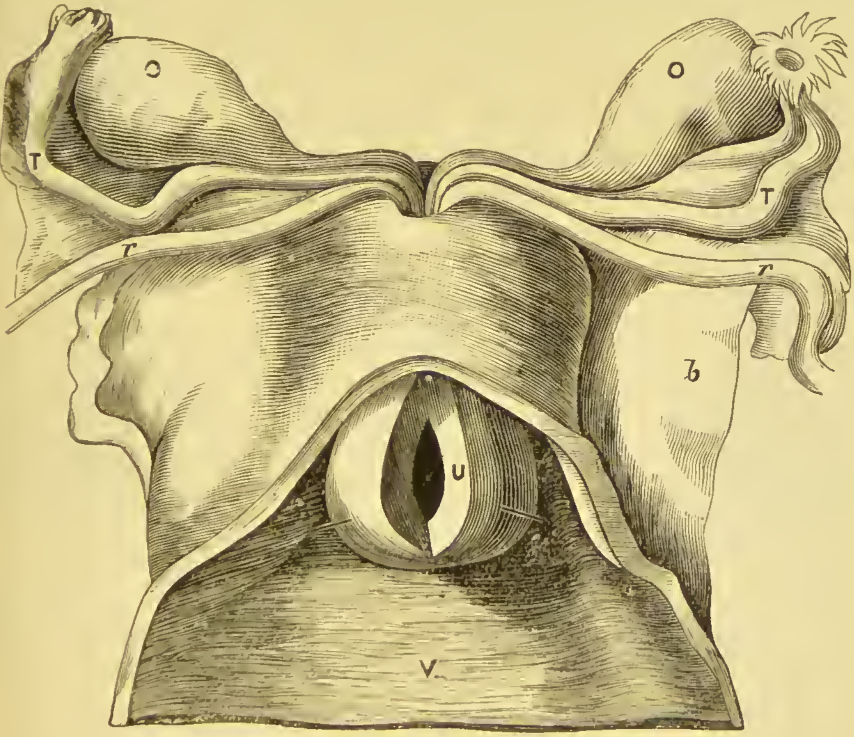

FIG. 204.

INVERSION OF UTERUS (*Crosse*). The inverted uterus (*U*) lying in the vagina (*V*) is cut open to show the peritoneal sac which does not contain the ovaries (*O*) ; bristles are passed into uterine orifices of tubes. *b* Broad and *r* round ligaments ; *T* tube.

Inversion has also occurred independent of the puerperal condition and of tumour growth ; this is quite exceptional.[1]

Etiology of Puerperal Inversion.

1. *Puerperal inversion.* This is by far the most frequent form ; out of 400 cases, 350 occurred in the puerperal uterus (*Crosse*).

Its former frequency was due to improper management of the third stage of labour. When the uterus was flabby and not contracting and the placenta not coming away, the removal of the latter by traction on the cord drew down the part of the wall to which it was attached and thus inverted the uterus. This accident was favoured by the situation of the placenta over the fundus (*Hennig*). Since the removal of the placenta by compression (which is best done by the Credé method—with the thumbs of both hands well down behind the fundus so that the uterus may be firmly compressed antero-posteriorly) has been adopted, this accident has become rarer.

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[1] Olshausen showed at the Berlin Obstetrical Society in 1901 a girl of 18 with an inversion of the uterus, no cause for which could be detected : Monats. f. Geb. u. Gyn., May 1901.

A dilated condition of the uterus (distension with blood clots) or a flaccid condition of the walls favours inversion.

Etiology of Inversion due to Tumours.

2. *Inversion secondary to uterine tumours* is much rarer. Of 400 cases, only forty ($10\,^\circ/_\circ$) arose in this way (*Crosse*). It has been observed with pedunculated fibromata (fig. 203),[1] and will be referred to again when we treat of them (*v.* Chap. XXXV.). Brewis[2] has recorded a case of its occurring spontaneously in a uterus from which a polypus had been previously discharged. It is frequent in sarcoma[3] (*v.* Chap. XLIV.), but very rare in carcinoma uteri. Tait[4] found it with villous epithelioma, and Barnes describes a specimen in which both conditions were present, but does not say which was the primary lesion.

SYMPTOMS.

The symptoms produced by inversion at the time of its occurrence, concern the obstretician rather than the gynecologist. There is the feeling of something giving way in the pelvis, accompanied with pain, hæmorrhage, and sometimes collapse. With complete inversion, there may be retention of urine; it often occurs, or at least becomes so marked as to attract the patient's notice, when she has made a straining effort. The cases where the patient says that it first came down several days after labour, are to be explained by supposing that partial inversion occurred after labour but only the final stage attracted attention.

If the uterus be not replaced at the time, the case becomes one of chronic inversion. The symptoms[5] of chronic inversion are—

Hæmorrhage,
Pain in the pelvis of a bearing-down character,
Anæmia and weakness.

Hæmorrhage is the most dangerous system. Menstruation is always profuse, as may be easily understood from the fact that the mucous membrane is extended in its area and lies exposed in the cervical canal and vagina. There is also inter-menstrual hæmorrhage, which comes on unprovoked or on straining.

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[1] Cases are recorded by Lee: Am. Jour. Obst., 1888, p. 616; Herman: Brit. Med. Jour., 1899, Vol. I., p. 467; and Simon: Brit. Gyn. Jour., 1901, II., p. 189.

[2] Edin. Med. Journ., July 1887.

[3] Cases have been recently recorded by Targett; Lond. Obst. Trans., 1897, p. 285; Lea: *ibid.*, 1901, p. 73; Galabin: *ibid.*, 1901. p. 226; and Swayne: *ibid.*, 1902, p. 366.

[4] Brit. Med. Journ., 1887, I., p. 66.

[5] These may not be present at first. Boyd records a case with no symptoms for three-and-a-half months after labour: Lond. Obst. Trans., May, 1903.

The *bearing-down pain* in the pelvis resembles that felt in prolapsus uteri. It varies indefinitely in intensity; sometimes it is very acute, rarely is it so slight that the patient becomes reconciled to her discomfort and is able for work.

The *anæmia* and *weakness* may be so marked as to cause suspicion of malignant disease.

DIAGNOSIS.

Diagnosis of recent Inversion.

The diagnosis of *recent inversion* is easy. If the placenta has not yet been born, the hands laid on the fundus to expel it by the Credé method find that the rounded fundus is replaced by a cup-shaped hollow.

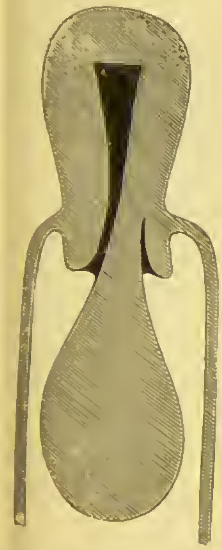

FIG. 205.

UTERINE POLYPUS (*Thomas*). The uterus in its normal position. Sound passes into uterine cavity.

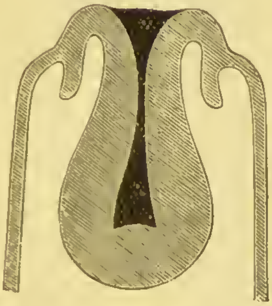

FIG. 206.

INVERSION OF UTERUS (*Thomas*). A cup-shaped depression is in the place of the uterus. Sound arrested at angle of flexion.

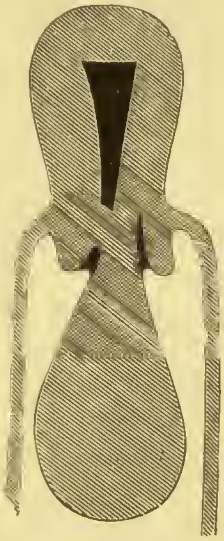

FIG. 207.

UTERINE POLYPUS. Adhesions round pedicle obliterate cervical canal.

The cervix is sometimes lifted up by the inverted uterus, so as to be "high above the pubes, even near the umbilicus" (*Crosse*). On passing the hand into the vagina to remove the placenta, care is required to recognise what is placenta and what is inverted uterus, and not to increase the inversion in detaching the placenta. If the placenta is already expelled, the hand on the abdomen recognises the same condition; while a large soft body, varying in size according to the extent of the inversion, fills the vagina.

Diagnosis of Chronic Inversion.

Chronic Inversion. Before the sound and the bimanual came to the gynecologist's aid in diagnosis, it was impossible to diagnose this condition with certainty. Mistakes were committed by the most eminent surgeons, just because they had not the means of examination which we now possess. Even nowadays mistakes occur through the hasty making of a diagnosis before all the means of examination have been employed. We therefore describe fully the routine examination.

1. Pass the fingers into the vagina; a rounded and firm or flattened and soft tumour, which bleeds easily, is felt in the vaginal cavity. Sweep the fingers round it, and recognise that it is free on all sides except at its upper extremity. Round this extremity is felt the cervix, the lips and fornices being recognised; or the cervix is thinned out to a ring and the fornices obliterated. If the cervical canal be obliterated by adhesions, the finger will not pass farther up; if it be patulous, it will pass for one-and-a-half to two inches and find that the cervica mucous membrane is reflected equally all round on to the neck of th tumour.

2. With one finger in front of the tumour and the other behind it lift it up towards the abdominal wall which is depressed with th external hand till the fingers in the vagina are in contact with it. Th external hand feels, in the place of the fundus uteri, a truncated bod with a depression in the centre (*see* fig. 206).

3. Now pass one finger into the rectum, which comes first on th body in the vagina: on dragging the latter downwards, the finger in th rectum reaches the upper border of the body and can feel that it end abruptly, and can pass into the cup-shaped end. Now depress th abdominal walls till they reach the finger in the rectum, or pass a soun into the bladder and direct the point of it backwards till it can b touched by the rectal finger.

4. The sound may be used to probe round the neck of the body whe there is not space for the finger to pass upwards. It is most usefu however, in differential diagnosis.

Differential Diagnosis of Inversion from Polypus.

Differential Diagnosis. Inversion must be differentiated from th following conditions:—

1. Polypus in the vagina, simple or with adherent pedicle;
2. Intra-uterine polypus;
3. Uterine polypus with partial inversion;
4. Prolapsus uteri;
5. Inversion and prolapsus.

1. In a uterine polypus which lies in the vagina, the fundus will found to lie somewhere else than in the vagina; it may be retroverte and thus escape recognition in the bimanual; the rectal examinati will then discover it. Having found what we suppose to be the fundu pass the sound along the side of the pedicle; if it is in the uterus, t sound passes more than $2\frac{1}{2}$ inches; if it passes $2\frac{1}{2}$ inches or less, suspe that partial inversion complicates the polypus.

When there are *adhesions round the pedicle obliterating the cervical canal*, a careful bimanual will reveal the fundus in its normal position and justify us in breaking down the adhesions with the sound so as to effect a passage into the uterine canal (fig. 207).

2. In a uterine polypus which is still *intra-uterine* the differential diagnosis is more difficult. A case has been recorded in which inversion of one horn of the uterus was diagnosed and amputated as a polypus. A careful examination *per rectum* under chloroform might detect the cup-shaped depression found in partial inversion; the uterine cavity is always enlarged when a polypus is present (fig. 208 and fig. 210).

3. Having satisfied ourselves that there is a polypus, the possibility of there being *partial inversion* of the uterus at its attachment must be kept in view (fig. 210). A careful rectal examination might reveal a depression on the peritoneal aspect of the uterus. The greater sensitiveness of the uterine mucous membrane also helps us; thus if we apply the écraseur without chloroform—which is not necessary—to remove the polypus, and the patient has great pain on our tightening up the wire, we may suspect that the loop has embraced the wall of the uterus.[1]

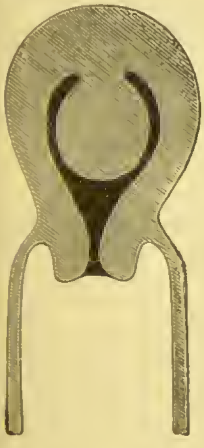

FIG. 208.

INTRA-UTERINE POLYPUS (*Thomas*).

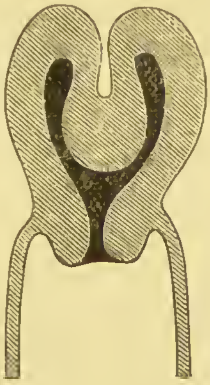

FIG. 209.

PARTIAL INVERSION (*Thomas*)

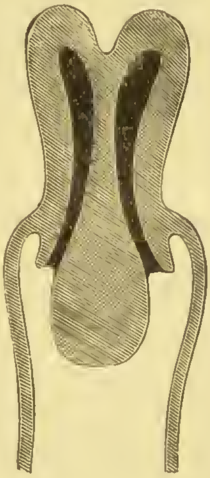

FIG. 210.

UTERINE POLYPUS+PARTIAL INVERSION (*Thomas*).

4. *Uncomplicated prolapsus uteri* would only on a very superficial examination be taken for inversion. The obliteration of the fornices, the presence of the os externum at the end of the protruded tumour, and that of the uterus within it—as demonstrated by the sound and examination per rectum—show that it is a case of prolapsus. If, how-

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[1] Faucon noted this in one case even though the patient was under an anæsthetic; the inversion was partial and only of one horn, and could not be recognised before the operation—Sur une forme particulière d'Inversion polypeuse de l'utérus, etc. Archiv de Toc., 1887, p. 1042.

ever, the prolapsus be due to a fibroid tumour of the cervix and the os externum be closed by adhesions or distorted, diagnosis is more difficult (*v.* Uterine Polypi).

5. *Prolapsus+inversion* is a rare condition. The specimen represented at fig. 203 is quite unique; the apex of the tumour protruding through the vulva consists of a submucous fibroid, the inverted uterus constitutes the next portion, while the base is formed by the inverted vagina.

COURSE AND RESULTS OF CHRONIC INVERSION.

Spontaneous Re-inversion.

Spontaneous re-inversion and cure has been observed, according to Malins, in fourteen cases.[1] From the rarity of its occurrence, it is to be regarded as a gynecological curiosity rather than a natural termination; the mechanism of its production is not yet known.

Toleration of the condition is also rare, though cases are reported in which the uterus has become reconciled to its new position and surroundings and the patient has recovered perfect health.

The greater proportion of unrelieved cases end fatally through anaemia, haemorrhage, septicaemia, or peritonitis.

PROGNOSIS.

As to the hope of reduction—of sixty-six cases collected by Macdonald, forty-four were successful.

TREATMENT.

Historical.

The reposition of the inverted uterus is one of the gynecological advances of the last fifty years. Up to 1856 when Tyler Smith effected reposition by gradual pressure with an air pessary, the only hope of cure was by amputation. About the same time White of Buffalo (1858) independently succeeded in replacing an inversion by pressure with the hand. After these a number of successful cases are recorded, among which the most noteworthy is one of Noeggerath who replaced an inversion of thirteen years' duration.

Various methods of reduction have been recommended by Tyler Smith, White, Emmet, Courty, Noeggerath, Thomas, Matthews Duncan, Barnes, Braxton Hicks, and Tate. It would take too much space to describe each method in detail; the references will enable the student to consult the original articles.

The treatment of chronic inversion[2] is best considered as follows:—

A. Reposition (*a*) with the hand alone or aided by instruments,
(*b*) by continuous slight elastic pressure,
(*c*) aided by hysterotomy;

B. Hysterectomy.

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[1] Op. cit.

[2] Reposition immediately after delivery belongs to Obstetrics.

A. Reposition.

The obstacle to reposition is the resistance of the tissue of the lower segment of the uterus; the principle of treatment is to overcome this by steady pressure.

Suppose that we have a case of inversion, how are we to proceed? The patient is kept perfectly at rest for a few days; injections of very warm water are employed twice or thrice daily; nutritious diet is given, and iron is usually required for anæmia. Ergot is required if there is menorrhagia; should it not be the menstrual period, the best thing to check hæmorrhage is injection of very hot water.

Having thus prepared the patient we proceed to reposition. Are we to employ the more rapid manual method or the slower one with an instrument? If the patient does not object to an operation under chloroform, and if we can have assistants to take turns with us in keeping up manual pressure, the former method should certainly be tried first.

Reposition with the hand.

(*a.*) *Reposition with the hand alone or aided by instruments.* For a few days previously, the largest size Barnes' bag which the patient can bear is placed in the vagina and distended; this makes space for the operator's hand, and may itself effect the reposition.[1] The patient, under chloroform, is placed in the lithotomy position; pass the right hand into the vagina, and grasp the uterus with the fingers as far into the angle of reflexion as possible. Now press the uterus steadily upwards against the left hand on the abdomen. The fingers may be separated as far as possible so as to open out the cervix.[2]

Noeggerath.

White.

Atthill.

Sometimes the process of re-inversion is started by dimpling inwards one horn of the uterus, and then forcing the depressed horn onwards as a wedge to open up the ring of the cervix.[3] As the hand cannot keep up steady pressure for any length of time, a cup is set on a curved iron rod with a spiral spring[4] to make the pressure equal (fig. 211). A curved wooden rod, with a large cup at one end and a small one at the other, has also been used to keep up pressure.[5] The end of the instrument is pressed against the operator's chest, and the cup is steadied with the hand in the vagina. It is evident that these instruments require a roomier vagina than when the hand alone is used; and if the cup slips unexpectedly it may rupture the fornix. Counter-pressure is made over the abdomen with the hand, or if the abdominal walls are

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[1] Kroner has collected six cases of inversion (longest of eleven years standing) replaced by this means; the pressure was applied for periods varying from one to eleven days.—Archiv f. Gyn., B. xiv., S. 270.

[2] Emmet—*Op. cit.*, p. 418. It is very doubtful whether the constricting cervix has anything to do with preventing reposition, though upward and outward pressure round the neck favours it.

[3] Noeggerath—Am. Med. Times, 1862, Vol. iv., pp. 230, 235.

[4] White—Intern. Med. Cong. Trans., Philadelphia, 1876. Byrne—New York Med. Journ., Oct. 1878.

[5] Atthill—*Loc. Cit.* Braxton Hicks—Brit. Med. Journ., Aug. 1872.

Thomas.
Schroeder.

thin and there is a distinct cup on the peritoneal aspect, with a cone of wood,[1] which is used to distend the ring of the cervix; the traction can be taken off the vaginal walls by fixing the cervix with volsellæ.[2] Counter-pressure may be made per rectum in the following way:—Pass index and middle fingers of right hand into rectum, draw down the uterus with the left hand until these fingers get fairly above the cervix so as to press on the margins of the peritoneal depression; grasp uterus now with left hand, turning it so that the fundus is towards the symphysis and the cervix towards the sacrum; finally, make pressure with the index and thumb in the angle of reflexion against the two fingers in the rectum.[3] This manual pressure is, with the help of assistants, to be kept up from half-an-hour to two hours according to the condition of the patient. If not successful in this time, the patient is kept in bed and under the influence of opium while a Barnes' bag is placed in the vagina to maintain the uterus as far as it has been replaced. When the uterus has been so far reinverted that the fundus is above the level of the os externum, the lips of the latter may be drawn together with wire sutures.[4]

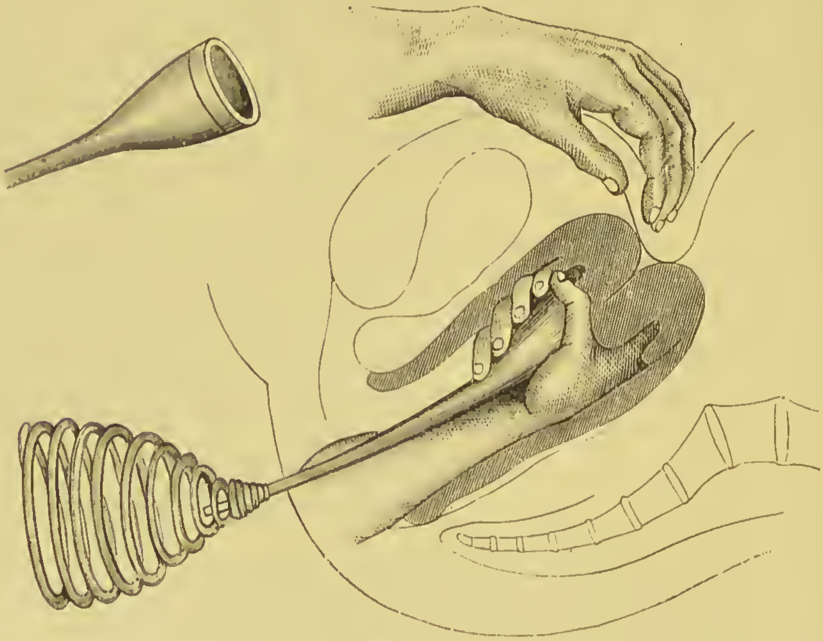

FIG. 211.

WHITE'S REPOSITOR, WITH ELASTIC SPRING PLACED AGAINST THE OPERATOR'S CHEST. While the right steadies cup and uterus, counter-pressure is made with the left hand or better by an assistant (*Thomas*).

Courty.
Emmet.

Abdominal section, so as to allow the operator to get at the constricting rim of the cup from its peritoneal side and dilate it with expanding forceps, has been proposed by

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[1] Thomas—*Op. cit.*, p. 468.
[2] Schroeder—*Op. cit.*, S. 203. Atthill—*Loc. cit.*
[3] Courty—Maladies de l'utérus, 1866.
[4] Emmet—*Op. cit.*, p. 430.

Thomas. It was successful in the first case; a second proved fatal from peritonitis. It has been tried unsuccessfully by A. R. Simpson, while Malins,[1] and Mundé[2] succeeded so far in dilating the ring, but failed in pulling up the uterus by the ingenious method of passing a thread through the fundus; Schmalfuss[3] has recorded a successful case. Brown succeeded in dilating the ring by getting at it per vaginam through an incision in the inverted fundus; a dilator was introduced and the rim expanded: the incision in the uterus was stitched before the inverted fundus was pushed up.

Reposition by Elastic Pressure.

(*b.*) *Reposition by continuous slight elastic pressure.* If manual reposition has failed, we may try the more gradual method; in some cases it is used from the first.[4] Gradual pressure may be produced by an india-rubber bag placed in the vagina and distended with water from a douche-can so that hydrostatic pressure is brought to bear.[5] Thiry[6] has devised an ingenious bag consisting of a double-walled india-rubber capsule, which is slipped over the uterus; when distended with air, it compresses and pushes up the inverted fundus. Pressure by an inflated bag is not so efficient as that produced by a wooden cup set on a stem[7] (fig. 212) with a vaginal (or, better still, a vaginal and perineal)[8] curve so that the pressure is made in the axis of the brim. Pressure may also be made by the four elastic bands which pass, two in front and two behind, to a broad abdominal bandage; by the tightening of the front or the back bands, the direction of pressure is altered.

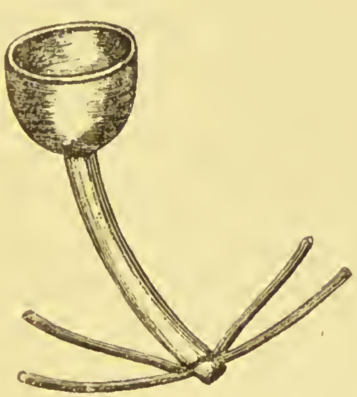

FIG. 212.

CUP WITH STEM AND ELASTIC BANDS which are fixed to an abdominal belt, for gradual reduction of inversion (*Thomas*).

In this method there are two points which require careful attention. (1.) The elastic pressure must always act in the line of the axis of the inverted uterus, and likewise of the axis of the pelvic brim; the cup is apt to slip off the uterus, and the handle of the instrument to alter its direction. *Pressure in a wrong direction is injurious, and may produce sloughing.* To prevent these accidents we pad, with antiseptic wadding or iodoform gauze, all round the neck of the inverted uterus and round the cup of the repositor when *in situ*; we watch the position of the instrument, and remove and re-apply it every day so as to see how it is pressing and whether there is sloughing.

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[1] Lancet, 1885, ii., 401.

[2] Amer. Journ. Obstet., 1888, p. 1279.

[3] Centralb. f. Gyn., 1886, p. 745.

[4] In a recent discussion before the London Obstetrical Society, the concensus of opinion was that this should be tried before having recourse to operation—Lond. Obst. Trans., 1902, p. 299.

[5] Runge—Lancet, 1887, i., p. 1293. Jaggard records an interesting case of inversion of twenty-one months' standing reduced after thirty-three days' use of the colpeurynter—Amer. Jour. Obstet., 1887, p. 130.

[6] Archiv de Tocolog., 1885, p. 925.

[7] Lawson Tait—Obstet. Journ., Vol. iv., p. 555.

[8] Aveling—*Loc. cit.*, records ten cases of successful reposition with his cup and stem which has a sigmoid curve.

(2.) There must be effective counter-pressure, so as to take the strain off the vaginal walls. This is effected by means of a broad flannel bandage, firmly secured round the loins, under which cotton wool is padded in such a way as to press exactly upon the fundus.

The elastic pressure is kept up from one to three weeks. Cases of reposition, at this period, or even after it, are recorded.[1]

Reposition aided by Hysterotomy.

(*c*) *Reposition aided by hysterotomy.* Where the constricting ring resists all attempts at reposition it must be divided by hysterotomy. Küstner,[2] who elaborated this operation, made a transverse incision in the posterior fornix, and opened into the pouch of Douglas, passed the finger into the peritoneal ring of the inversion to determine the position of the appendages and break down any adhesions, and then incised the inverted uterus in the middle line posteriorly (from the contracted ring to within an inch of the fundus) the incision being carried through the muscular wall into the peritoneal cup. He then re-inverted the uterus and closed the wound in the uterine wall from the peritoneal aspect by means of deep and superficial sutures, the opening into the peritoneal cavity through the posterior fornix allowing this to be done.

Hart[3] succeeded in replacing an old-standing inversion by manipulation through the incision in the posterior fornix without having recourse to hysterotomy.

More recently Taylor[4] and Peterson[5] have operated on the same principle, only making the incision through the anterior fornix, and getting at the uterus through the utero-vesical pouch. Peterson removed a wedge-shaped piece of the uterine wall on either side of the incision so as to allow the edges to come better together.

Haultain[6] got access to the uterus by abdominal section, cut through the constricting ring posteriorly, continuing the incision in the uterine wall as it was re-inverted until reduction was complete. By getting access to the uterus through the abdomen the incision in the former is reduced to a minimum and hæmorrhage more easily controlled.

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[1] As by Neugebauer, after three weeks—Centralb. f. Gyn., 1887, p. 63.
[2] Cent. f. Gyn., 1893, S. 945.
[3] Ed. Obstet. Trans., Vol. xxiv., p. 19.
[4] Lond. Obst. Trans., 1902, p. 229.
[5] Am. Journ. Obst., 1903, Vol. i., p. 516
[6] Brit. Med. Jour., 1901, Vol. ii., p. 974.

B. Hysterectomy.

Where all means of reposition have been tried and failed, or where the uterus is ulcerated and gangrenous, hysterectomy is called for. Also in cases of inversion associated with malignant disease, *e.g.*, sarcoma. Formerly amputation of the uterus at the level of the cervix was the usual treatment for such cases, but now that vaginal hysterectomy has become a recognised operation without a serious mortality, it is preferable. The operation will be described under hysterectomy for cancer of the uterus.

CHAPTER XXXV.

TUMOURS OF THE UTERUS. FIBROID TUMOURS: PATHOLOGY AND ETIOLOGY.

LITERATURE.

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UNDER Tumours of the Uterus we have to study—

Fibroids,
Polypi,
Tuberculosis,
Adenoma,
Papilloma,
Carcinoma,
Deciduoma malignum,
Sarcoma.

Introductory. The term "polypus" is so convenient clinically that we retain it, but we must remember that it involves cross-classification, including one variety of fibroid tumour — the fibrous polypus — while the mucous polypus is a pedunculated adenoma. As adenoma is of importance in relation to commencing carcinoma, we shall refer to it also under that subject. Deciduoma malignum or chorio-epithelioma, will be treated of under carcinoma. In the chapters that follow we shall consider Fibroids and Cancer at some length, the others briefly.

Fibroid tumour is considered first, as in frequency it comes before cancer, although in seriousness the latter is by far the most important. It presents a remarkable contrast with cancer in every respect: it shows itself early in life, while cancer is late; it occurs among the well-to do, while cancer makes its ravages among the poor and badly fed; it is the tumour of the sterile, while cancer is that of the fertile; it rarely affects life, while the fate of the cancer-patient is almost sealed.

Synonyms.—Myoma or Fibro-myoma Uteri; Fibrous Tumour; Tumeur fibreuse; Hystérome.

Nomenclature.

As this tumour is composed of both the connective tissue and muscular elements of the wall of the uterus, it is at once a fibroma and a myoma; the most correct term is therefore *fibro-myoma*. In the majority of cases, however, the fibrous tissue preponderates, so that the tumour resembles a fibroma; the English term fibroid (a term derived from the root of fibroma and εἶδος, = like a fibrous tumour) is therefore not inappropriate, and is also more convenient.

A special variety of fibroid tumour, containing epithelial elements, will call for consideration by itself at the end of this chapter under "adeno-myoma."

PATHOLOGY.

Under this head we shall describe

- Situation;
- Structure—naked eye and microscopic;
- Mode of growth, varieties;
- Changes in uterus;
- Degenerative changes.

SITUATION.

They occur much more frequently in the body of the uterus than in the cervix; of seventy-four cases of fibroid tumours recorded by Lee, only four were in the cervix. In the body of the uterus the most common seat is *the posterior wall;* they occur less frequently in the anterior wall, and very rarely at the side of the uterus.

STRUCTURE.

Naked-eye Structure of a Fibroid Tumour.

They are composed of the same elements as the muscular wall of the uterus, viz., of non-striped muscular fibre and fibrous tissue. These are both present in every case, as the name for these tumours (fibro-myoma) implies. The proportion of these constituents, however, varies; in the early stages a myoma, or tumour in which the muscular tissue preponderates has been described, but more usually there is excess of fibrous tissue producing a *fibro-myoma*, which is distinctly marked off from the wall of the uterus and grows slowly. It is of firm consistence which makes it feel like a foreign body in the softer muscular wall, and of a pale colour, resembling fibrous tissue ; it cuts like cartilage, the cut surface having a glistening satin-like appearance and being often uneven through the firmer fibrous tissue forcing out the softer parts between; the bundles of fibrous tissue have a concentric arrangement round one or more centres (fig. 213). The tumour is surrounded by loose fibrous tissue, which with the immediately adjoining muscular layer constitutes the so-called *capsule ;* it has a broad connection at one point with the muscular tissues of the wall, or lies free in its capsule. Sometimes the submucous and subperitoneal forms develop so near the surface that they have not a layer of the muscular wall to form a capsule and may hence be called "free" in contrast with the encapsulated (Haultain).[1] The loose fibrous tissue which separates the tumour from the adjoining wall is however present in these cases. The looseness of the tissue round the tumour is important in relation to its removal by the process described

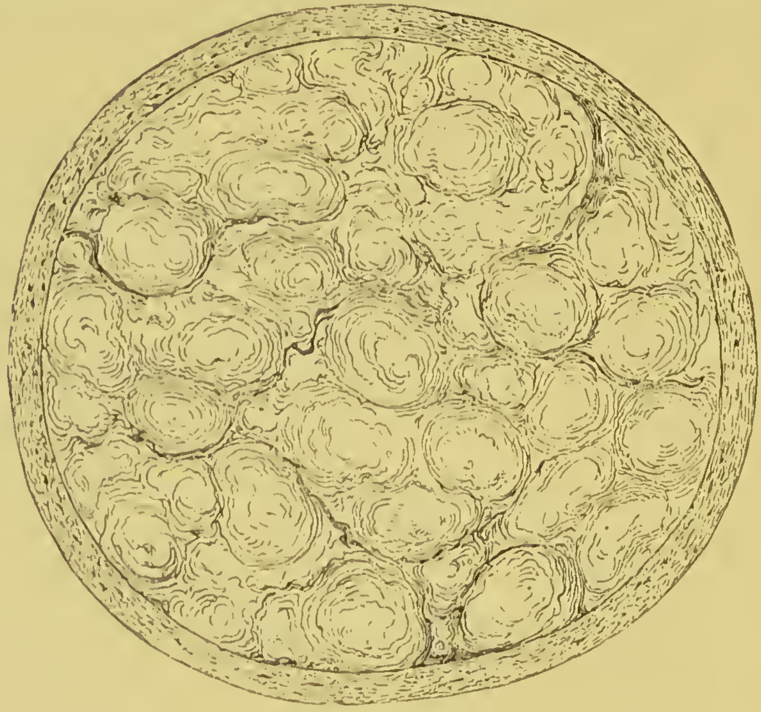

FIG. 213.

SECTION OF A LARGE FIBROID TUMOUR, with the Fibres arranged round several centres (*Sir J. Y. Simpson*).

Capsule of a Fibroid.

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[1] *Op. cit.* This monogram contains beautiful illustrations of the various seats and structure of fibroid tumours.

as *enucleation*. Few blood-vessels penetrate into the substance of the tumour, although the tissue immediately round it is very vascular and often contains enlarged veins which resemble the venous sinuses of the pregnant uterus (fig. 224); nutrition is apparently effected by transudation from the capsule. In some rare cases, however, these tumours possess a cavernous structure consisting of dilated blood-vessels. Virchow has described this form as "Myoma teleangiectodes seu cavernosum;" cases are recorded by Leopold and Schroeder.

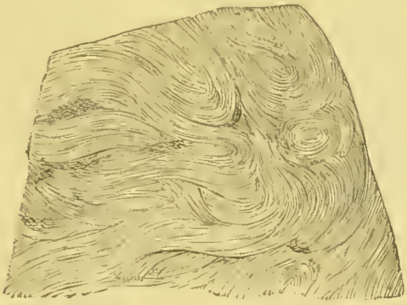

FIG. 214.

SECTION OF FIBROID TUMOUR, showing wavy bundles of fibrous tissue ¼ (*Gusserow*).

Microscopic Examination.

On microscopical examination, the myomatous form has the appearance of muscular fibre of the uterus—the muscle-cells being, according to Doran,[1] larger than those of the uterus in which it grows. The fibromatous form (common fibroid tumour) has the appearance shown at fig. 214, in which the wavy bundles of fibrous tissue are well seen. Sometimes the bundles of fibrous tissue are separated by spaces (fig. 215), which Klebs considers to be lymphatic spaces. Nerves have been traced into the substance of these tumours by Lorey; but, as an interesting case recorded by Freund shows, they are not sensitive: a submucous fibroid was extruded beyond the vulva; the lower third, which protruded beyond its capsule of mucous membrane, was not sensitive

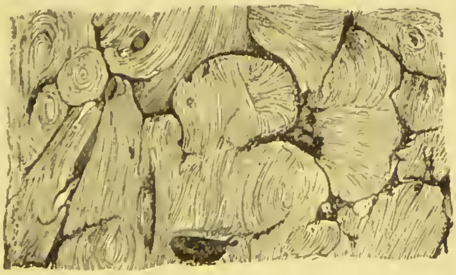

FIG. 215.

SECTION OF FIBROID TUMOUR, showing spaces between bundles of fibrous tissue ¼ (*Gusserow*).

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[1] *Loc. cit.* He figures a section of a myoma from a pregnant uterus which shows this well, the muscle-cells being still larger than the hypertrophied ones of the uterus.

to the prick of a needle; the upper two-thirds, from their being still covered by *mucous membrane*, were very sensitive. The mucous membrane covering them is ciliated,[1] like that of the uterus generally; though when it has been exposed for some time (*e.g.*, when a fibrous polypus comes to be in the vagina) it becomes squamous.[2]

MODE OF GROWTH—VARIETIES.

Rate of Growth.

Fibroid tumours grow slowly; the more they consist of fibrous tissue, the slower the growth. During pregnancy, they increase more rapidly in size; in the puerperium, they may become smaller again and even cease to be recognisable. It is difficult to determine the rapidity of growth. It is unsatisfactory to estimate it from the appearance of symptoms and compare the time elapsed with the present size of the tumour; the only reliable data are got from the examination of the tumour from time to time. Schorler has reported on eighteen cases observed by Schroeder and comes to this conclusion: a tumour will not grow to be for the first time recognisable in less than three months' time, and in a year may not be much larger; in five years it may grow to the size of a man's fist, and in thirteen to the size of the head. On the other hand, Kleinwächter, from the study of forty cases under his own care, affirms that this represents their growth as more gradual than the facts warrant. While for long periods they may remain stationary, at others they increase perceptibly from month to month.

After the menopause, their growth is, as a rule, arrested. A considerable number of cases,[3] however, give rise to trouble and require operative interference after that period.

Mode of Growth.

All fibroid tumours are, in the beginning, interstitial or intra-mural. As they increase in size they expand in the substance of the wall or towards one of the free surfaces (peritoneal or mucous), thus becoming subperitoneal or submucous. Hence three varieties are recognised—

Varieties of Fibroid Tumours.

interstitial, *subperitoneal*, and *submucous*. It is evident that these terms are relative, as it is difficult to say when an interstitial fibroid becomes submucous. Gusserow limits the term "submucous" to *pedunculated* submucous, and "subperitoneal" to *pedunculated* subperitoneal fibroids. A submucous tumour, however, often gives rise to the clinical signs diagnostic of the submucous variety long before it becomes pedunculated. Each variety requires short description. For the sake of convenience we describe first the fibroid tumours found in the body of the uterus: the comparatively rare fibroid tumours of the cervix are best noticed separately (p. 421).

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[1] Gervis—Brit. Med. Journ., 1886, ii., p. 871.

[2] Reamy—*Loc. cit.*, p. 817.

[3] As many as 10 per cent. of cases calling for operation are about the menopause (Bland Sutton—Lond. Obst. Trans., 1903, p. 107). This is the percentage of cases calling for operation, and takes no account of the large proportion of cases in which fibroids are harmless.

Subperitoneal Fibroids.

A. The Subperitoneal grow outwards into the peritoneal cavity. The thickness of the pedicle varies (fig. 216); its length determines the mobility of the tumour. When the tumour attains a certain size, one of two things happens. (1.) It may grow up into the abdomen and expanding there draw the uterus forcibly upwards, producing by this traction elongation of the cavity (fig. 216) with thinning of the walls.

Growth into Abdomen.

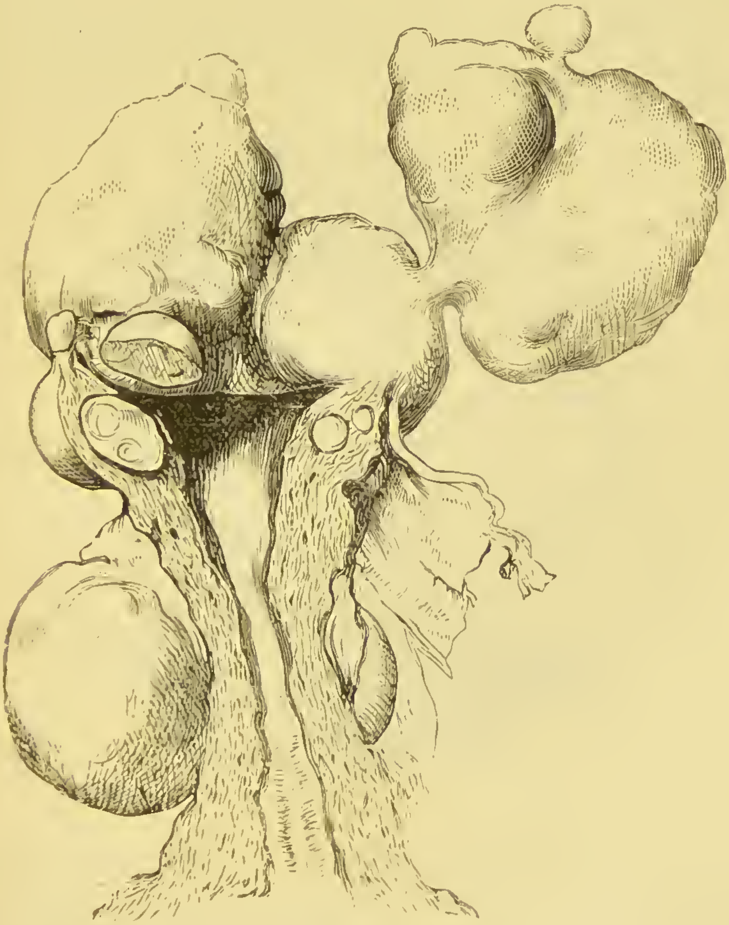

Fig. 216.

Uterus with Elongated Cavity due to the presence of several Fibroid Tumours (*Sir J. Y. Simpson*).

An interesting case is recorded by Tinns,[1] in which the cavity of the body of the uterus was elongated to 6 inches; the cervical canal, extending only 1 inch inwards from the os externum, ended blindly at a point 2 inches distant from the beginning of the cavity of the body; the intervening portion was obliterated so as to form a solid muscular cord. Virchow says that the body may even be torn from the cervix by

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[1] Lond. Obst. Trans., Vol. ii., p. 34.

Incarceration in Pelvis.

forcible traction. (2.) The tumour, growing from the first within the pelvis, may through pressure produce the symptoms of incarceration; or, having a long pedicle, may fall down from the abdomen into the pelvis and produce similar symptoms. The point of origin of the tumour and the length of the pedicle determine whether these symptoms can be relieved by pushing the tumour out of the pelvis. Twisting of the pedicle occurs less frequently in fibroid than in ovarian tumours; when it occurs, it leads to œdema or gangrene. Schroeder[1] mentions a case where, on operating, he found the tumour distended with blood from partial twisting of the pedicle. Timmers records a case, diagnosed as an ovarian tumour with twisted pedicle, treated successfully by laparotomy.[2] Adhesions form with other organs, as occurs with all abdominal tumours; these may become new sources of nutrition. Sometimes they lead to detachment of the tumour from the uterus: the tumour is anchored, as it were, to the abdominal walls; and, when the uterus from pregnancy or other causes becomes displaced, the pedicle gives way. Turner[3] reports a case in which a small calcareous fibroid was found free in the pouch of Douglas; a second

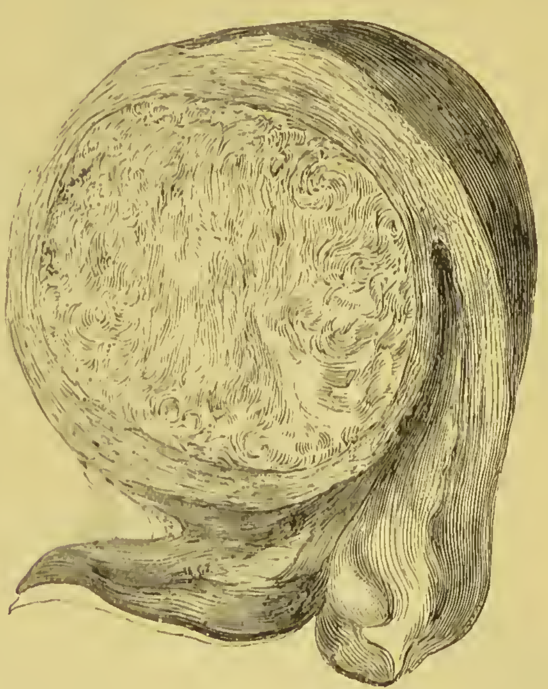

FIG. 217.

INTERSTITIAL FIBROID TUMOUR (*Sir J. Y. Simpson*).

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[1] *Op cit.*, S. 230.

[2] Centralb. f. Gyn., 1892, S. 242. See also a case by Cappie—Obstet. Journ., ii., p. 302. Twisting of the uterus four times round its axis, is recorded by Pick: Cent. f. Gyn., 1892, S. 445. Bland Sutton—Lond. Obstet. Trans., 1899, p. 296, and Schwarz—Brit. Med. Journ., 1900, Vol. ii., cp. 66, also record cases.

[3] Edin. Med. Journ., 1861, p. 698.

was attached to the posterior wall of the bladder and to the pelvis; a third was bound down to the bladder and the pelvic wall by adhesions, but still retained its connection with the uterus by a thin pedicle. Adhesions to the intestines have produced symptoms of intestinal obstruction.[1] Hernial protrusion of the abdominal walls has been described by Düll:[2] he reports two cases of this very rare occurrence; in one case, the skin covering the hernial sac became gangrenous, so that the tumour lay exposed.

Interstitial Fibroids.

B. The Interstitial remain in the substance of the uterine wall, and do not become pedunculated. The appearance of such a tumour is well seen at fig. 217. Usually there are many such tumours present (fig. 216). Bland Sutton[3] has counted as many as 120, varying in size from a coriander seed to a cherry stone, in one uterus.

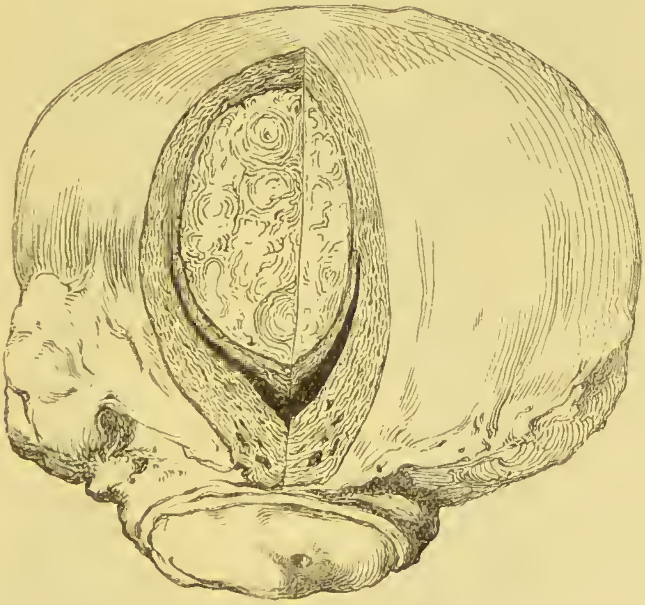

FIG 218.

SUBMUCOUS FIBROID TUMOUR PROJECTING INTO UTERINE CAVITY (*Sir J. Y. Simpson*).

Submucous Fibroids.

C. The Submucous are the most important clinically. They lie immediately underneath the uterine mucous membrane, and project into the cavity of the uterus (fig. 218). They are attached over a broad base, or by a pedicle; when they hang free, they are known as fibrous polypi—the most frequent form of uterine polypus (*v.* Chap. XXXIX.). When a fibrous tumour projects into the uterine cavity, it acts as a foreign body and produces uterine contractions. These lead, in some instances, to *pedunculation* of the tumour and even to its extrusion from the uterine cavity; in such a case, it hangs as a polypus in the vagina. In other rare cases, the capsule ruptures and the liberated tumour is expelled in shreds—*spontaneous enucleation.*

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[1] Eade—Lancet, Dec. 21, 1872.

[2] Cited by Schroeder, *op. cit.*, S. 233. Lawson Tait mentions the same condition—Brit. Med. Journ., 1888, i., p. 861.

[3] Brit. Med. Journ., 1901, Vol. i., p. 814.

CHANGES IN THE UTERUS.

Changes in Uterus.

The muscular wall hypertrophies, more especially when the tumour is submucous or interstitial. In submucous fibroids, the *mucous membrane* is also hypertrophied.

Wyder[1] has studied the hypertrophied mucosa with special reference to the causation of the bleeding, and describes a glandular and interstitial endometritis.

From a comparison of the mucous membrane in subperitoneal as compared with interstitial tumours he comes to the conclusion that the thicker the muscular capsule is the less likely is the tumour to affect the circulation in the mucous membrane. The uterine glands in this case are hypertrophied, but the interglandular tissue little or not at all affected; while the nearer the tumour comes to the uterine cavity, the more does the interglandular connective tissue become affected, and this sometimes at the expense of the glands which atrophy. The bearing of this on bleeding is that it is the cicatrisation of the interglandular connective tissue, causing compression of the veins, which leads to congestion and bleeding. Semb[2] finds a hypertrophy of the mucosa which he does not consider inflammatory in nature as Wyder does. This is often followed by atrophy from the pressure of the tumour, or inflammatory and other complications. Bleeding is not due to changes in the mucosa but to general enlargement of the uterus.

Changes in the position of the uterus have been already referred to; when subperitoneal fibroids rise up into the abdomen, it is sometimes drawn forcibly upwards by them and may be twisted on itself.[3] At other times the weight of a subperitoneal or interstitial tumour leads to prolapsus uteri. Inversion of the uterus is also occasioned by submucous fibroids when these are situated near the fundus and when their pedicle does not admit of their extrusion as polypi.[4]

Pressure effects on the ureters and bladder, the rectum, and the pelvic vessels and nerves will be considered in Chap. XXXVI. *Affections of*

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[1] *Op. cit.*—He examined twenty uteri extirpated in Gusserow's Clinique for fibroid tumour.

[2] From the examination of twenty-three fibroid uteri extirpated in Leopold's Clinique at Dresden.—Ueber das Verhalten der Uterusschleimhaut bei Myomen: Archiv f. Gyn., 1893, Vol. xliii., S. 200. Marchesi also describes changes which he considers hyperplastic rather than inflammatory—Le alterazioni dell'endometrio in casi di fibromi dell'utero: Annali di Ostet. et Gyn., Dec. 1894.

[3] As in the case reported by Küstner: Beitrage zur Geb. u. Gyn., 1872, i., S. 7; the uterus was twisted two and a half times, so that the broad ligaments formed a spiral. Skutsch records another case operated on by Schultze in which the uterus was twisted half round—Centralb. f. Gyn., 1887, S. 52.

[4] Kötschau records a case of partial inversion, with what he calls "eversion of the uterine mucous membrane," *i.e.* its being pushed downwards without the tumour's being pedunculated—Centralb. f. Gyn., 1887, S. 757.

remote organs occur in large tumours. Thus Bantock [1] considers fatty degeneration of the liver a consequence of fibroid tumours, while hypertrophy and sometimes dilatation of the heart is present, as in the case of large abdominal tumours generally.[2] There seems a special tendency to cardiac changes in the case of fibroid tumours, to fibroid and fatty degeneration of the walls with dilatation of the cavities. This may

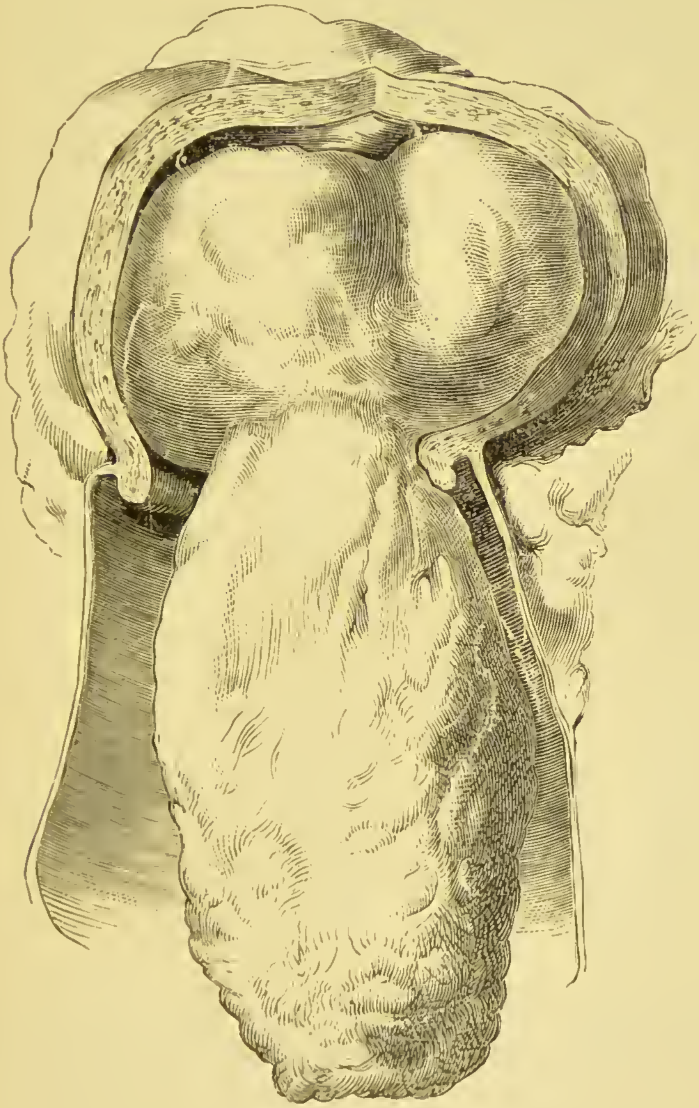

Fig. 219.

Pedunculated Submucous Fibroid in process of extrusion (*Sir J. Y. Simpson*).

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[1] Brit. Gyn. Journ., 1887, Vol. ii., p. 84.

[2] Fenwick—On intra-abdominal tumours as a cause of cardiac degeneration: Brit. Gyn. Journ., 1887, Vol. ii., p. 72. Hennig has found circulatory disturbances even with small fibroids. Cent. f. Gyn., 1894, S. 724.

even be an indication for operation.[1] *Changes in the uterine appendages*, ovaritis,[2] and salpingitis also occur. Hydro- and hæmatosalpinx have been found.

DEGENERATIVE CHANGES.

These are the following: Softening, Induration, Calcification, Suppuration, and (very rarely) Malignant Degeneration.

Softening. The *softening* may be due to fatty degeneration, necrobiosis, or to myxomatous degeneration. Fatty degeneration has been noticed during the puerperium, the tumour undergoing retrogressive changes along with the uterus. It rarely produces naked eye changes in the appearance of the tumour. Knox reports a case with yellow deposits in the tumour, which on scraping gave drops of oil—a lipo-myoma.[3] Necrobiosis[4] is a process limited to the tumour itself, the central portion being affected first. The tumour is on section soft, of a pink or purplish colour, due to diffusion of blood pigment, and ultimately loses its whorled appearance. The nuclei degenerate and lose their affinity for stains. As to the cause of this necrotic process nothing is known, but it is more frequent in multiparæ, as if pregnancy favoured its occurrence. Myxomatous degeneration resulting in the formation of spaces containing mucus between the layers of the tumour, sometimes occurs.[5] These changes pass into the fibro-cystic tumour (*v.* Chap. XXXVIII.).

Induration. *Induration*, with atrophy, or shrinking of the tumour occurs in some cases after the menopause; the muscular tissue undergoes fatty degeneration and disappears, the fibrous tissue contracts.[6] An infarction has also been found.[7]

Calcification. When *calcification* occurs, lime salts (chiefly phosphates) are deposited in the fibrous tissue, and produce the so-called womb-stones.[8] This deposit usually commences in the centre of the tumour and extends outwards, more rarely in the external layers so as to form a shell round the tumour. Sometimes it is so extensive that the tumour can be cut with a saw, and the cut surface polished; more usually it is incomplete, and forms a coral-like skeleton. Calcification of portions of the tumour is often accompanied by suppuration in others, probably from interference with nutrition.

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[1] Wilson—Relations of the organic affections of the heart to fibromyoma of the uterus: Lond. Obst. Trans. 1900, p. 176. Fehling found in fourteen cases which he studied for change in the heart condition, cardiac changes in four.

[2] Bulius has examined the ovaries from fifty cases of fibroids and found increase of the stroma and changes in the vessels with cystic degeneration of the follicles—Verhalten des Eierstockes bei Fibro-myoma Uteri: IV. Gynäkolog. Congress zu Bonn, 1891. So also Popow has examined the ovaries from forty cases in Lebedeff's Clinique at St. Petersburg. He finds interstitial oöphoritis frequent, with occasionally cystic degeneration and atresia of the follicles: Zur Frage über die Veränderungen der Ovarian bei Fibromyoma Uteri: Cent. f. Gyn., 1890, No. 49. Adeno-carcinoma has also been described (Edebohls, Am. Journ. Obstet., 1891, p. 691).

[3] Johns Hopkins Hosp. Bull., Oct. 1901.

[4] Fairbairn—A Contribution to the Study of one of the Varieties of Necrotic Change—the so-called Necrobiosis—in Fibro-myomata of the Uterus: Jour. of Obst. and Gyn. of the Brit. Emp., August, 1903. He has examined nineteen specimens, and says that 5 to 7 p.c. of fibroids removed by operation show this change.

[5] Smith records extensive mucoid degeneration in an intra-ligamentous tumour (Brit. Med. Jour., 1902, Vol. ii., p. 901).

[6] Sir J. Y. Simpson—Obst. Mem., p. 115.

[7] By v. Ott. The patient had felt pain over it, ascribed to a local peritonitis—Centralb. f. Gyn., xii., S. 274.

[8] See a case by Thorn—Zur Casuistik der Uterussteine: Zeits. f. Geb. u. Gyn., Bd. xxviii.

Suppuration.

Suppuration occurs frequently in submucous fibroids, as the result of injury from operative interference or from constriction of the pedicle during the process of expulsion. It has also been observed as a rare occurrence in subperitoneal fibroids, accompanying calcification or from torsion of the pedicle. In such a case, the pus either finds its way through the abdominal walls or fatal peritonitis follows.

Malignant Degeneration.

Whether *malignant* degeneration specially affects fibroid tumours, is a disputed point. A few cases of carcinomatous[1] changes in the endometrium, and even in the heart of the tumour, have been described, as also of sarcomatous degeneration[2] in the substance of the tumour. These are so rare, in proportion to the frequency of fibroids, that their occurrence may be regarded as a coincidence.[3]

As to the frequency of these various changes, Martin[4] gives us the following interesting statistics of his own cases. Of 205 fibroids he found slight retrogressive changes in 70, fatty degeneration in 3, suppuration in 10, œdematous swelling in 11, cystic degeneration in 8, blood-cavities in 3, sarcomatous degeneration in 6, but never carcinoma; while Noble[5] found in 218 cases, necrosis in 12, calcareous degeneration in 5, myxomatous in 5, cystic in 5, and sarcomatous in 2.

Fibroid Tumours of the Cervix.

The occurrence of fibroid tumours in the cervix is rare; but, when they are present, they often give rise to difficulty in diagnosis on account of the distortion which they produce. They spring from either wall, and grow outwards towards the peritoneal cavity and into the cellular tissue, or downwards into the vagina. In the former case they dissect off the peritoneum, becoming "intra-ligamentous;" and from their situation, embedded in the cellular tissue, and the symptoms produced by their incarceration, they become a source of great danger.[6] From their situation and the absence of uterine enlargement, they do not cause menorrhagia, but symptoms on the part of the bladder and rectum are frequent.[7] When submucous, they produce elongation of one lip and may form a polypoidal tumour in the vagina (fig. 220); the accompanying distortion of the os externum leads to difficulty in diagnosis. Cases in which a large tumour bulges through the ostium vaginæ have been mistaken for inversion and prolapsus. Sometimes prolapsus is due to the weight of the tumour and disappears after its removal.[1] The interstitial form is easily mistaken for inversion, when the os is converted into a transverse cleft which escapes observation and the unaffected lip is thinned out to a mere band.

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[1] See Ehrendorfer's interesting paper on this subject—Die primäre carcinomatöse Degeneration der Fibromyome des Uterus: Cent. f. Gyn., 1892, S. 513. Semb (Archiv f. Gyn., Bd. xliii., S. 221) gives a case and figures, also a peculiar papillary hypertrophy of the epithelium. Also Geuer—"Ueber das gleichzeitige Vorkommen von Carcinom und Myom am Uterus:" Cent. f. Gyn., 1894, S. 341.

[2] See "Sarcoma Uteri," Chap. XLIV. Also Ricker—Beitrag zur Etiolog. der Uterusgeschwülste: Archiv f. patholog. Anatom., Bd. cxlii., S. 193.

[3] Haultain—Malignant Uterine Complications of Fibro-myomata: Edin. Obstet. Trans., 1904.

[4] Ueber Myome: Archiv. f. Gyn., Bd. xxxii., S. 470.

[5] Brit. Gyn. Jour., 1901-2, p. 170.

[6] Pozzi—"De la valeur de l'hystérectomie, etc.": Thèse d'agrég., Paris, 1875.

[7] As in the cases recently recorded by Lewers (Brit. Med. Jour., 1901, Vol. ii., p. 53), Tate (Lond. Obst. Trans., 1903, p. 173), and Galabin (*ibid.*, p. 175).

Johnston reports on ninety-six cases of fibroid tumour of the cervix, dealing especially with their effect on pregnancy and labour. He finds that abortion is more frequent with fibroid tumours in the body, premature labour with those in the cervix; he affirms that during pregnancy or labour one third of the mothers and more than one-half of the children die, so that, where the tumour cannot be removed, celibacy is to be recommended.

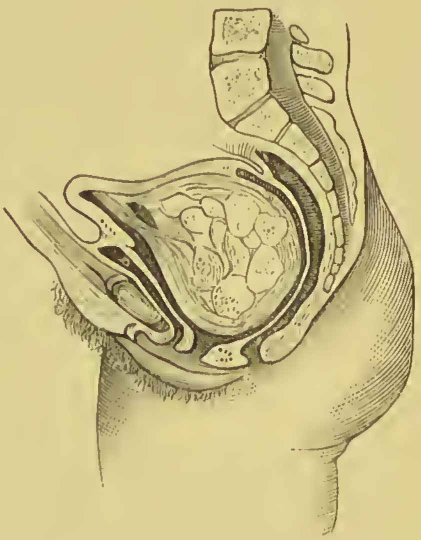

Fig. 220.

Cervical Fibrous Polypus springing by a pedicle from the region of the os internum, and pushing itself under the whole mucous membrane of the cervical canal; so that its insertion is partly continuous with the tissue of the uterus, partly truly submucous. Between these a cavity has formed through tearing of the mucous membrane, so that the tumour has apparently two pedicles (*Schroeder*).

ETIOLOGY.

Gusserow, to whose exhaustive article—Die Neubildungen des Uterus—in Billroth's Handbuch we are greatly indebted in this Chapter, says in regard to etiology, "Ueber die Ursachen der Uterusmyome wissen wir so wenig, wie über die Ursachen der meisten pathologischen Neubildungen, nämlich *Nichts*" (of the causes of fibroid tumours we know as little as of the causes of most pathological new-formations, that is *nothing*). Virchow and Winckel have both made elaborate attempts to assign a cause to the development of fibroid tumours. The number and variety of causes adduced by these observers only show how far we are from the knowledge of the real cause; with such a variety of causes, the difficulty would not be to explain why they are present in some but why they are not present in every case. The development of the true *myoma* has been studied by Kleinwächter. He examined uteri with very small myomata and found that there was a small isthmus of muscular fibre uniting the myomatous mass, lying in its connective tissue capsule, with the muscular tissue around. This isthmus sometimes bifurcates and resembles in form an obliterated blood-vessel (capillary). He also saw some capillaries surrounded with round cells and forms transitional to muscular fibres. Hence he concludes that the true myoma is due to a degeneration of a blood-vessel with its branches.[1] From finding micrococci in them, Galippe and Landouzy[2] have suggested that they are due to the irritation of a parasite. More recently, Gottschalk[3] has also described an endarteritis and proliferation of the connective tissue around the vessels. Fibroids are caused by some irritant leading to active congestion. This irritant may be chemical or parasitic—it is not a coccus; nor is the change an inflammation, but a new-formation.

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[1] Barnes—Obst. Trans., iii., p. 211.

Olshausen[4] has found pain (sensitiveness to pressure and dysmenorrhœa) and menorrhagia complained of before any tumour could be detected by palpation, and thinks this points to congestion of the uterus as being an early clinical symptom in some cases of myoma.

Fibroids are without doubt the most frequent new-formation in the uterus. Klob says that they are present in 50 p. c. of women who die over fifty years of age; and Bayle, in 20 p. c. of those who die over thirty-five years; both of these estimates are probably beyond the mark.

Development of Fibroids according to Age.

Their appearing is in some way related to the development of the sexual apparatus. Thus, there are no well-authenticated cases of their arising before puberty[5] or after the menopause. The majority of patients are between the ages of thirty and forty when they first seek medical advice, as it is evident from the accompanying table based on statistics collected by Gusserow (fig. 221). Schroeder says that of 196 patients, who during three years of his private practice consulted him

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[1] Bland Sutton found in a uterus with small fibroids, the tiny tumours "as bundles of plain muscle fibres, twined around and intimately associated with the walls of capillaries," suggesting that the muscular coats of the vessel were the source of the tumours (Brit. Med. Jour., 1901, p. 814).

[2] Brit. Med. Journ., 1887, i., p. 799.

[3] Ueber die Histogenese und Etiologie der Uterusmyome: Archiv f. Gynäk., 1895, Bd. xliii., S. 534.

[4] Notizen ueber das klinische Anfangsstadium der Myome: Archiv f. Gynäk., xxviii., S. 494.

[5] Tillaux reports a case of a fibroid tumour of the cervix in a girl of nineteen which had caused symptoms for six years—Annales de Gyn., xxvi., p. 241.

TABLE AND DIAGRAM SHOWING FREQUENCY OF FIBROID TUMOURS ACCORDING TO AGE OF PATIENT.

NUMBER OF CASES.

Out of 919 cases

15	were below 20 years.				
156	,,	between	20 and	30	years.
357	,,	,,	30 ,,	40	,,
338	,,	,,	40 ,,	50	,,
36	,,	,,	50 ,,	60	,,
12	,,	,,	60 ,,	70	,,
5	,,	above	70		,,

(*Gusserow*).

PERCENTAGE PROPORTION.

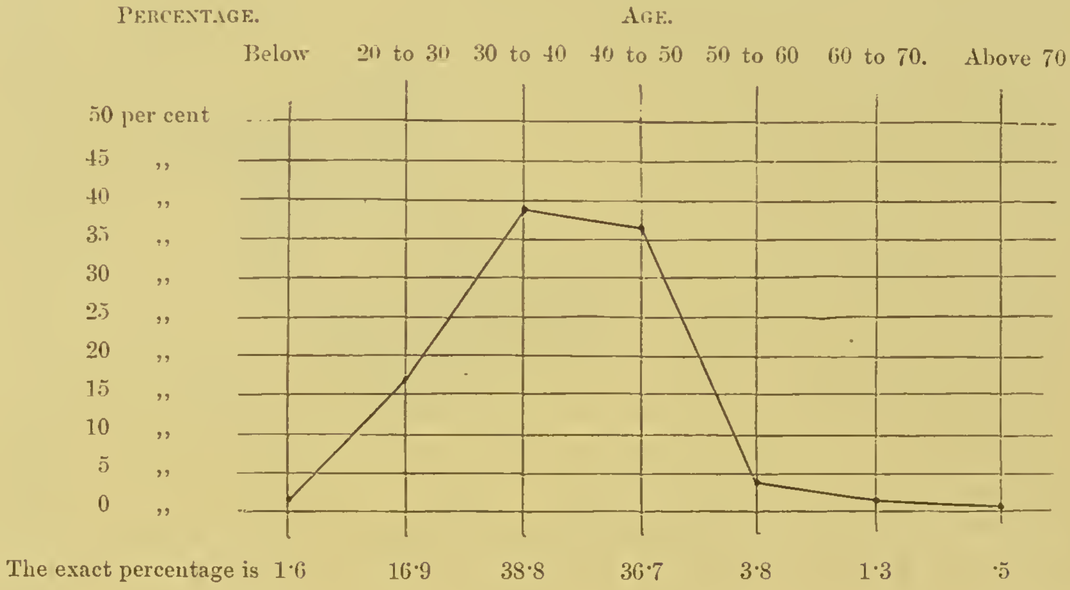

Fig. 221.

for fibroid tumours, 104 were between forty and fifty, and 62 between thirty and forty.

Sexual activity seems to predispose to their development, as a much larger number of patients with fibroid tumours belong to the married than the unmarried class. Of 1876 cases from various authorities collected by Reamy,[1] we find that 1422 or 75 p. c. of persons with fibroid tumours seeking advice were married. But when we take into account the larger proportion of the married in the population generally, and the still larger proportion in those who seek advice, we find that we cannot affirm that fibroids are more common in the married than the unmarried.[2] As the presence of a fibroid tumour interferes with conception, we often find sterility present.

ADENO-MYOMA.

LITERATURE. *Baldy* and *Longcope*—Adenomyomata of the Uterus: Am. Jour. Obst., 1902, Vol. I., p. 788. *Cullen*—Adeno-myome des Uterus, Berlin, Hirschwald, 1903. *Kelly*—Operative Gynecology, Vol. II., p. 385, Henry Kimpton, London, 1898. *Kossmann*—Die Abstammung der Druseneinschlusse in den Adenomyomen des Uterus und der Tuben: Arch. f. Gyn., Bd. 54, S. 359. *Lockstaedt*—Ueber Vorkommung und Bedeutung von Drusenschlauchen in den Myomen des Uterus: Monats. f. Geb. und Gyn., 1898, Bd. 7, S. 188. *Meyer*—Ueber Drusen, Cysten, und Adenome in Myometrium bei Erwachsenen: Zeits. f. Geb. und Gyn., 1900, Bd. XLVII., S. 618; Bd. XLVIII., S. 130, 329. *Nebesky*—Casuistische Beitrag zur Kenntniss, der Adeno-myome des Uterus: Arch. f. Gyn., 1903, Bd. 69, Heft II., p. 338. *Pick*—Ueber die epithelialen Keime der Adeno-myome, etc.: Arch. f. Gyn., 1900, p. 193. *Von Recklinghausen*—Die Adenome und Cyst-adenome der Uterus-und Tuben-wandung, Berlin, 1896.

In our last edition we mentioned the existence in some fibroid tumours of epithelial elements, the origin of which had been referred to relics of the Wolffian bodies, to diverticula of the duct of Müller, or to the glands of the uterine mucosa. About the same time appeared von Recklinghausen's classical monograph, which first gave a satisfactory account of their presence, and calls for our describing as a new variety of uterine fibroid the fibro-adenoma. It is a rare form of tumour; Cullen, in examining 800 uterine fibroids, came on 19—scarcely 3 p. c. Of von Recklinghausen's 30 specimens, 23 were from the uterus, 13 from the Fallopian tube angle, and 7 from the tube, while Cullen describes one as intraligamentous, and one from the round ligament.[3]

According to von Recklinghausen there are two types, according as the glandular elements arise from the uterine mucosa, or from remnants of the Wolffian bodies. In the former case the tumour is interstitial, may be present in any of the walls of the uterus, or surround its cavity like a ring; the glands in it can be traced to the uterine mucosa (or that of the cervix) and may be distended into cysts. When it springs from the Wolffian bodies, however, the tumour may be found in the tube, but more frequently in the uterus where it occurs only in the posterior wall. It is interstitial in position, but unlike the myoma, has no capsule; it is a "diffuse" or "infiltrating" fibroid. Sometimes the larger tumours have a fan-shaped disposition, showing a medulla and cortex like the kidney—a system of epithelial tubes placed closely together, a main canal with subsidiary canals opening into it, the latter sometimes dilated into cysts or pseudoglomeruli. He distinguishes four varieties, (1) hard tumours in which the myomatous tissue preponderates; (2) cystic, with dilated glands; (3) a soft variety, with preponderance of the adenomatous element; (4) the angiomatous, with dilated vessels—the softest of all.

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[1] *Loc. cit.*, p. 818.

[2] Schumacher found that in the Basle Clinique the frequency of the married to the unmarried among the cases of fibro-myoma were as two to one; while the relative proportion of married to unmarried who sought advice was as five to one, and in the general population between thirty and fifty years of age as 3·4 to 1: Beiträge zur Etiologie der Uterus-Fibromyome, Basle, 1889.

[3] Another case is recorded by Blumer—Am. Jour. of Obstet., Vol. XXXVII., p. 37.

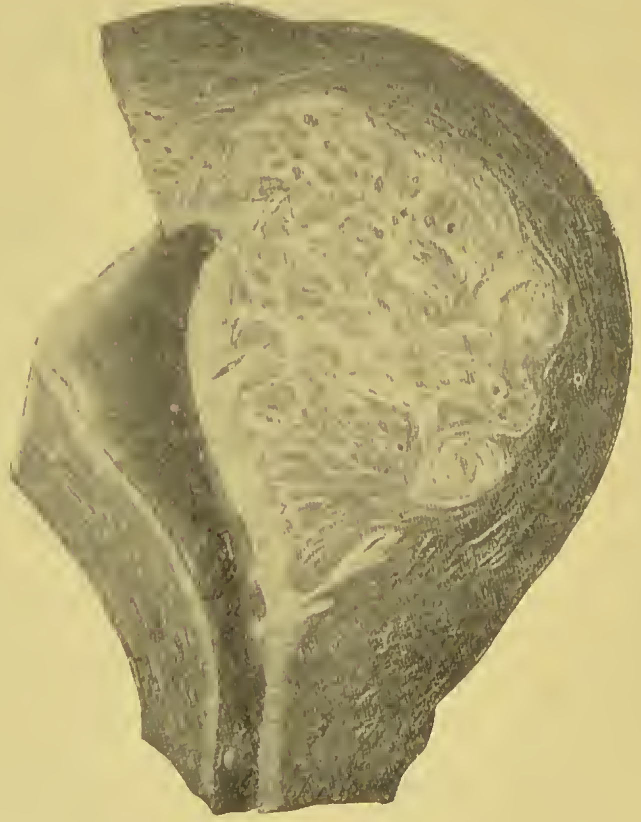

FIG. 222.

DIFFUSE ADENOMYOMA OF THE POSTERIOR WALL OF THE UTERUS (*Cullen*).

Cullen finds that in most of his specimens the epithelium has the characters of the uterine glands, and is surrounded with the same connective tissue; in some cases the glands are directly continuous with those of the uterus.[1] The occasional presence of tarry blood (as it is found in cases of retained menses) in the spaces, suggests that these detached islets of uterine mucosa maintain their menstrual function.

The characteristic features of the adenomyoma are the absence of a capsule (fig. 222), the fibres of the myoma interlacing freely with the uterine wall around, so that the tumour cannot be shelled out like the ordinary fibro-myoma, and the presence of spaces lined by epithelium, often closely resembling that of the uterine mucosa (fig. 223). The interest of these rare tumours is pathological rather than clinical. They cannot be distinguished before operation from the ordinary fibro-myoma; owing to the fact that they cannot be shelled out they cannot be treated by myomectomy—the uterus must be removed with the tumour.

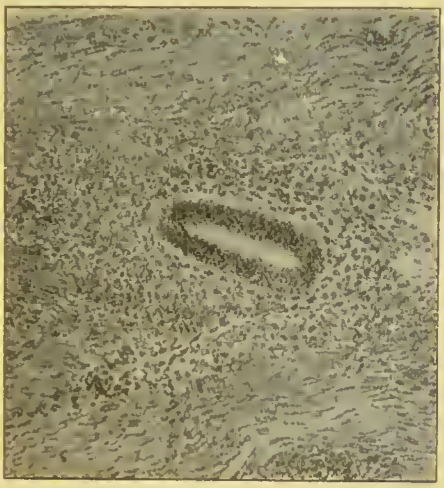

FIG. 223.

GLAND SPACE FROM A DIFFUSE ADENOMYOMA OF THE ANTERIOR UTERINE WALL (*Cullen*).

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[1] Direct continuity of the glands in the tumour with those of the uterine mucosa was noted in one of Baldy and Longcope's cases.

CHAPTER XXXVI.

FIBROID TUMOURS OF THE UTERUS: SYMPTOMS; DIAGNOSIS; PROGNOSIS.

LITERATURE.

See Literature of Chaps. XXXV. and XXXVII. and p. 425.

Like other pathological conditions of the uterus, fibroid tumours sometimes produce no symptoms and their presence is discovered accidentally or on *post-mortem* examination. This absence of symptoms is more likely to occur should the tumour be small, or should there be no sexual activity as in unmarried women. In the latter case, although symptoms appear only when the patient enters married life, the tumour may have been already a long time present. Subperitoneal tumours, even when large may only produce discomfort from undue abdominal distension.

The symptoms usually present may be tabulated as follows:—

1. Menorrhagia, irregular hæmorrhages;
2. Painful menstruation;
3. Pelvic sensations due to size and weight of tumour, peritonitic pain;
4. Symptoms of pressure on bladder and rectum,
   blood-vessels and nerves,
   ureters;
5. Sterility and abortion.

Hæmorrhage in Fibroids.

1. *Hæmorrhage* is the most characteristic symptom in submucous fibroids, and appears first as a *gradual increase* of the normal menstrual flow; it never begins with a sudden flooding as in carcinoma uteri. In *menorrhagia*, the hæmorrhage comes from the hypertrophied mucous membrane of the uterine cavity generally; it does not come from the mucous membrane covering the surface of the tumour, which is frequently thinned and atrophied, nor from the substance of the tumour

itself which as we have seen is sparingly vascular. When, however, the submucous fibroid projects as a polypus, passive congestion and hæmorrhage from the mucous membrane covering it may be occasioned by the constriction of its pedicle. *Irregular hæmorrhages* arise from ulceration of the mucous membrane covering the tumour, or rupture of the dilated veins in its capsule. Fig. 224 shows a case[1] in which, through the rupture of a uterine sinus in the lower part of the tumour, a sudden and fatal hæmorrhage occurred. In subperitoneal fibroids menstruation is not increased, and in certain rare cases is diminished.

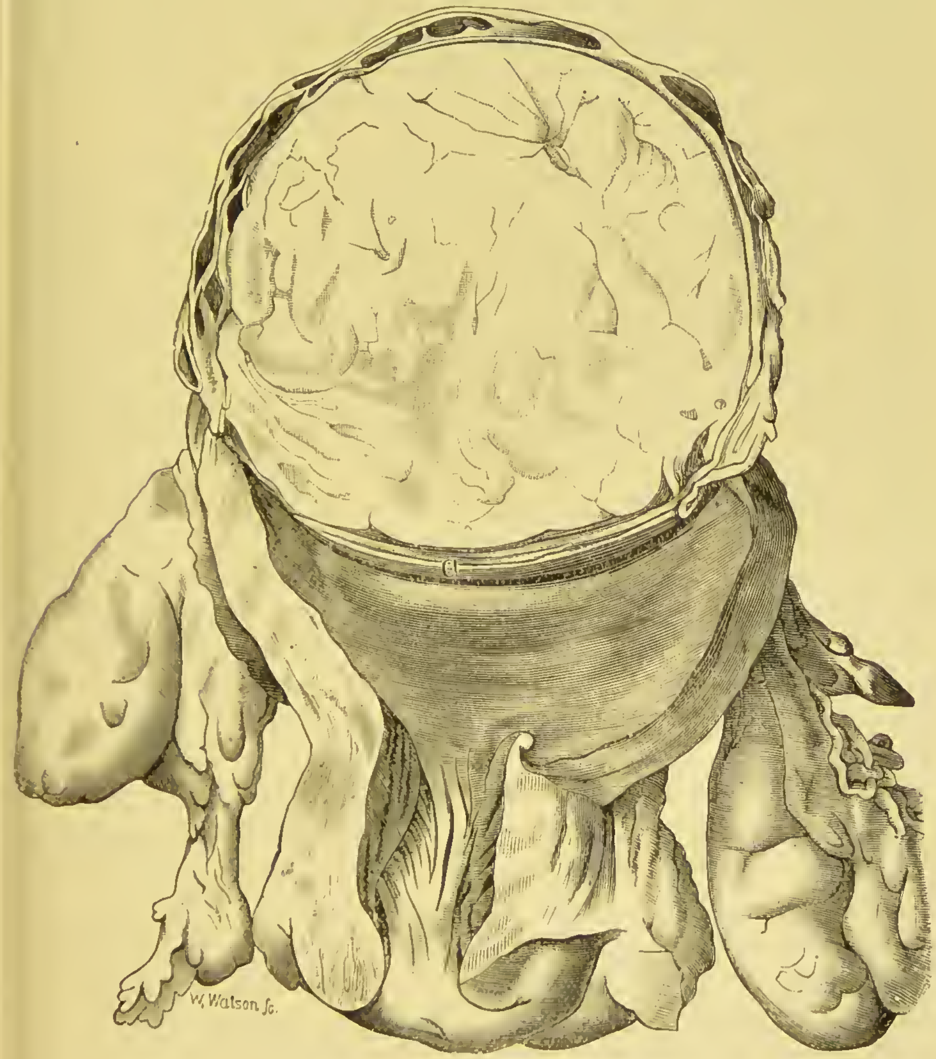

FIG. 224.

UTERUS CONTAINING FIBROID TUMOUR from a case which terminated fatally through hæmorrhage. Note the large venous sinuses in the capsule, one of which ruptured at the point *a* (*Matthews Duncan*).

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[1] Reported by Matthews Duncan—Edin. Med. Jour., 1867, p. 634. He also refers to a case of Cruveilhier's in which death was occasioned in the same way.

Pain in Fibroids.

2. *Painful menstruation* is sometimes present. In the submucous variety there is often characteristic uterine *dysmenorrhœa*, in which the pain resembles labour pains. The congestion causes the polypus to swell and this produces uterine contractions (*v.* Uterine Polypi). In interstitial and even in subserous fibroids, there is often pain at the menstrual period which cannot be thus explained. In subserous fibroids with a pedicle containing large vessels, as well as in interstitial, Gusserow ascribes the pain to the distension of the tumour with blood. The pain is of a stretching or dragging nature, and is quite different from the pain of uterine contractions.

Weight Symptoms.

3. *Increased weight* of the uterus occasions *sensations* of discomfort, which are described as "fulness or weight in the pelvis," "a sensation of dragging" "bearing down pain." When the tumour is so large that it fills the pelvis and becomes wedged in it, intense pain is produced; this is either always present, or recurs only at the menstrual periods when the tumour is distended with blood. As in carcinoma uteri, peritonitic pain—indicated by local tenderness and reflex contraction of abdominal muscles—may arise at any time from secondary chronic peritonitis. Neuralgic pain is sometimes present locally (see below), but may be also through the whole body.

Pressure Symptoms.

4. Frequency of micturition, due to *pressure on the bladder*, is the most common pressure symptom. *Pressure on the urethra* produces difficulty of micturition and even retention; with some patients, this recurs regularly at the menstrual period. Even very small fibroids, when they are situated in the anterior uterine wall, may *press on the neck of the bladder* and produce symptoms of cystitis. *Pressure on the rectum* by fibroids in the posterior wall occasions constipation or, more rarely, mucous diarrhœa. Incarcerated fibroids have produced complete obstruction, and led to a fatal result[1] or furnished an indication for colotomy. Intestinal obstruction has also resulted from adhesions between the tumour and the small intestine.[2] *Pressure on the veins* produces hæmorrhoids and varicose veins in the legs. Interesting cases of neuralgia due to pressure on *pelvic nerves* have been recorded. In these cases the neuralgia entirely disappeared as soon as the tumour was lifted up and supported by a pessary.[3] Compression of the *ureters*, with consequent dilatation and hydronephrosis, occurs less frequently in fibroid tumours than in carcinoma. The reason for this is evident; in carcinoma the compression is due to infiltration of the tissue round the ureter, which from the anatomical relation of the ureters to the cervix easily occurs; fibroid tumours in their growth simply press against the ureters, and may push them aside. Several cases of single and double hydronephrosis and of death from uræmia[4] have been re-

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[1] Holdhouse—Lond. Path. Soc. Trans., iii., 371.

[2] Eade—Lancet, Dec. 21, 1872.

[3] Kidd—Dub. Quart. Journ., 1872. Jude Hüe—Annales de Gyn., iv., p. 239.

[4] Gusserow quotes cases from Jude Hüe, Murphy, Hanot—Neubildungen, etc., S. 52.

corded. Bright's disease has developed secondarily.[1] In fibroid tumours where pressure symptoms are present, we should always examine the urine.

Sterility in Fibroids.

5. *Sterility* is frequent. Of 149 cases of married women collected by Schroeder, 33 per cent. were sterile and the average number of children to each mother was about three. When conception occurs, fibroid tumour may lead to abortion or complicate labour.

PROGRESS AND RESULTS.

In the course of the growth of a fibroid, pain may develop, which means that the tumour is undergoing secondary changes. A subserous tumour may undergo twisting of the pedicle, though this is a much rarer occurrence than in the case of ovarian tumours. Pain with an interstitial tumour suggests necrobiosis, of which it is the most frequent symptom,[2] local tenderness and rise in temperature being less common.

A *relative cure* usually takes place at the menopause, when the tumour ceases to grow.[3] In the case of subserous tumours this may happen even before that time.

Spontaneous Disappearance.

Spontaneous disappearance of the tumour has been observed in certain cases, although nothing definite is known as to the means by which it is effected. After a careful sifting of the literature of this subject, Doran [4] has collected thirty-seven cases in which this occurred. Of these, thirteen were associated with the puerperium which seems to affect the tumour by a process comparable to involution. In sixteen cases the disappearance occurred apart from the puerperium; and as the patients were under forty-five, the effect of the menopause may be excluded: in six of them there was a history of inflammatory complications, leaving ten cases of apparently spontaneous disappearance. The remaining eight cases occurred after forty-five,[5] and may be accounted for by the effect of the menopause.

Spontaneous Expulsion.

Complete cure also results from *spontaneous expulsion.* This occurs in three ways:—

(1.) By pedunculation and extrusion of the tumour as a polypus (*v.* under Uterine Polypi);

(2.) By enucleation, in which the tumour is shelled *en masse* out of its bed;

(3.) By the breaking down of its substance and consequent expulsion in fragments.

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[1] Hubert—Bul. de la Soc. Anatom., 1873, p. 870.

[2] In Fairbairn's 19 cases pain was present in 16, and tenderness noted in only 5. Cullingworth—An analysis of 100 cases of fibro-myoma: Jour. of Obst. and Gyn. of Brit. Emp., Vol. i., p. 3.

[3] Exceptionally such tumours continue to grow after the menopause. See paper by Müller and discussion; Archiv f. Gyn., 1891, Bd. xl., S. 340. So also Kleinwachter, v. ante p. 426.

[4] *Op. cit.*

[5] In two of these, the age is not given; and in one it is doubtful.

Breaking-down of Fibroids.

Enucleation occurs in submucous and also in interstitial tumours. The mucous membrane of the capsule ulcerates, and the tumour is thus exposed; partly through suppuration, partly through uterine contractions, it becomes detached all along the line of its capsule and, being thus liberated, is expelled.

Spontaneous Enucleation.

The *breaking-down* of the substance of the tumour is a much more dangerous process for the patient. As it is a slow one, there is a risk of absorption of septic matter. The commencement of this change is indicated by increase in the size of the tumour, which becomes tense and painful to the touch. There is a purulent fœtid discharge from the vagina, and sometimes hæmorrhage. The constitutional symptoms of loss of appetite and hectic fever afterwards develop, and most of such cases end fatally.

Expulsion of the tumour generally takes place per vaginam. As in other tumours we may have inflammatory adhesions forming with neighbouring organs, followed by suppuration and perforation by the tumour. Thus calcified fibroids have perforated into the bladder, and have been mistaken for vesical calculi.[1] A fibroid has perforated into the rectum, and has been discharged per anum. In some cases adhesions with the abdominal wall have formed, and the tumour has been thus discharged.

Causes of Death.

Considering the frequency of fibroid tumours, it is rare that *death* follows immediately from their presence. A fatal result, however, may follow from (1) suppuration in the tumour producing death from septicæmia; (2) uræmia, due to compression of the ureters; (3) direct hæmorrhage; (4) acute peritonitis.

PHYSICAL SIGNS: DIFFERENTIAL DIAGNOSIS.

The physical signs of fibroid tumours are usually so well marked that diagnosis is easy. In certain cases, however, diagnosis is very difficult; and when inflammation is superadded, certainty is impossible. Physical diagnosis is best considered under two heads: *a.* of small fibroid tumours, up to the size of a walnut or egg; *b.* of larger ones, which rise up as distinct tumours into the abdomen.

a. OF SMALL FIBROID TUMOURS.

Diagnosis of Small Fibroid Tumours.

1. Pedunculated *submucous* fibroids should be easily recognised. When they are small and not projecting through the os, we have to dilate the cervix to ascertain their presence and attachment; when larger and projecting into the vagina, they may readily be mistaken for inversion of the uterus. On sweeping the finger round the base, we recognise the commencement of the cervical canal unless the polypus be adherent at

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[1] M'Clintock: Dub. Quart. Jour., Feb. 1868.

its neck leading to obliteration of the canal (*v.* fig. 207). Further, the bimanual or rectal examination shows the fundus uteri to be in its normal position.

2. Small *interstitial* fibroids when situated *low down* and causing bulging of one lip of the cervix, give rise to difficulty; owing to the great enlargement of one lip, the os is displaced to the other side and its form altered to that of a mere slit which easily escapes observation. Such cases have been occasionally mistaken, even by the most experienced, for inversion. This mistake is prevented by examination per rectum. Further, the sides and base of the tumour must be carefully scrutinised to discover the os; when this is found, the sound will show the position of the uterine cavity.

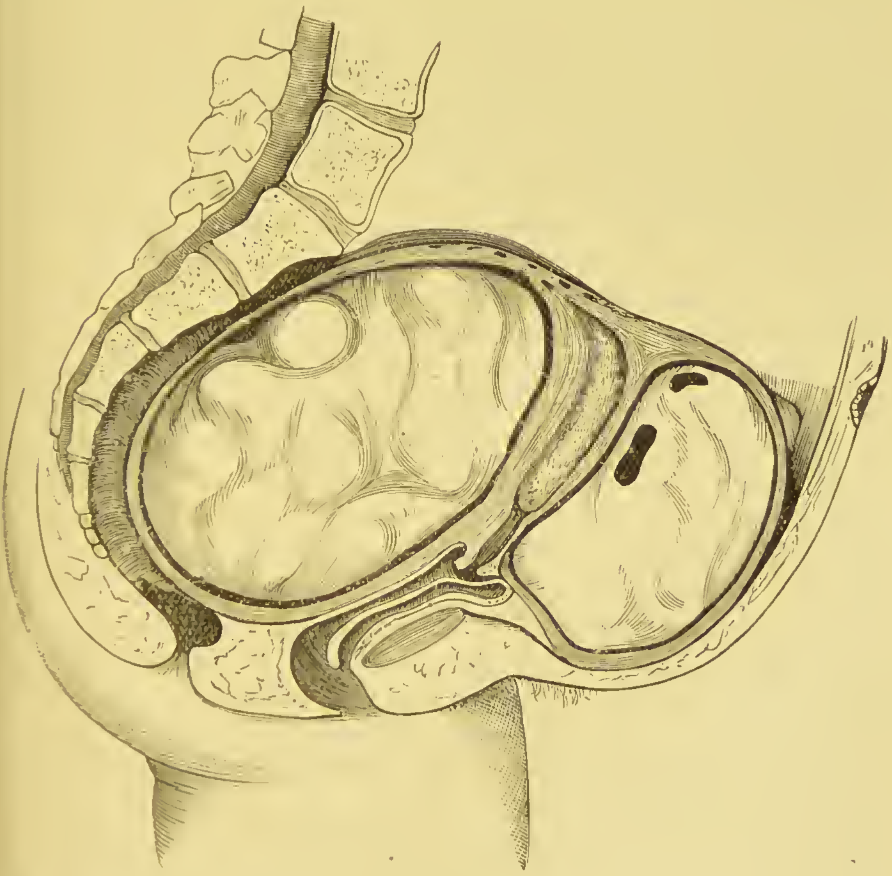

FIG. 225.

CASE OF TWO-AND-A-HALF MONTHS' PREGNANCY ASSOCIATED WITH TWO LARGE FIBROID TUMOURS—one in the anterior, the other in the posterior wall. The uterus and tumours were removed by Laparotomy (*Barnes*).

3. *Interstitial* fibroids placed *high up* in the uterus, or small *subserous* ones with a *broad base* of attachment, often escape detection. To ascertain their presence we proceed as follows. Pass the sound; this defines the course of the uterine canal and position of the fundus. Now make

the bimanual examination with the sound, as represented in fig. 78; the finger in the anterior fornix detects the thickening of the anterior wall, produced by a small fibroid. Now steady the sound with the left hand, and pass the forefinger of the right hand into the rectum so as to feel the sound lying in the uterus. Should there be a fibroid in the posterior wall, the finger recognises an unusual thickness of tissue between it and the sound. Carry the sound, firmly grasped by the left hand, towards the symphysis, so as to bring the fundus better within reach of the rectal finger; and, by moving it from side to side, ascertain whether the tumour is intimately connected with the uterus so that it moves along with it. From their being largely composed of fibrous tissue, these tumours are firmer than the uterine wall; the *localised hardness*, therefore, helps us in recognising them.

Differential Diagnosis of Small Fibroid Tumours.

Small fibroid tumours, when submucous or interstitial, require to be diagnosed from chronic metritis,
early pregnancy,
ante- and retro-flexion.

When subperitoneal and pedunculated from—
enlarged Fallopian tube or ovary,
tumour or inflammatory collection in the broad ligament.

In *chronic metritis* the uterus is not globular but flat, and the enlargement is equable; the uterine canal is patulous; the os is everted, and shows catarrhal patches. We must remember that chronic metritis is occasionally present along with a fibroid tumour.

In *early pregnancy*, the uterus is soft and elastic: the cervix is generally softened, while in fibroids it remains hard. Pregnancy, however, may occur in a uterus which is already the seat of a fibroid tumour (fig. 225); and in such a case the diagnosis becomes certain only after the uterus is considerably enlarged. The possibility of pregnancy must specially be kept in mind here, as we involuntarily think of using the sound to aid in detecting fibroids.

Anteflexion is closely simulated by a fibroid in the anterior wall; a body is felt in the anterior fornix, continuous with it, but separated by a groove. Similarly, a fibroid in the posterior wall has all the characters of the *retroflexed fundus*. Examination by the sound (*v.* fig. 181), and especially by the sound plus the bimanual, clears up the case.

Enlarged *Fallopian tube*[1] or *ovary* may closely resemble a pedunculated subserous fibroid; they are not so firm and sharply defined, nor do they move so rigidly with the uterus. In the former also there are the history and symptoms of tubal disease. *Inflammatory collections* in the broad ligament are recognised by their history, the fixation of the uterus, and the changes they undergo; but *solid tumours* there cannot be diagnosed from pedunculated fibroids except by exploratory incision.

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[1] Horrocks discusses this point in differential diagnosis in the Brit. Med Journ., 1886, i., pp. 441, 586, 821.

b. OF LARGE TUMOURS.

When the tumour extends into the abdomen, we proceed with the systematic examination as described at page 92.

Diagnosis of Large Fibroid Tumours.

Inspection.—The contour of the abdomen is different in a fibroid as compared with an ovarian tumour. While in the former the abdominal wall slopes gradually towards the epigastrium from the most prominent part of the tumour, in the latter it drops down suddenly. This difference in contour is most noticeable in patients under chloroform. *Palpation.*—The tumour has a well-defined outline, and a firm solid consistence. It is intimately connected with the uterus; this is best ascertained by laying hold of the cervix with the volsella, when the cervix will be found to move along with the abdominal tumour. Subserous fibroids have a certain range of free movement depending on the length of the pedicle. In soft fibroids, there may be intermittent contractions. *Percussion.*—The note is absolutely dull, unless intestines come between the tumour and the abdominal wall. *Auscultation.*—The uterine souffle is heard most distinctly at the sides, sometimes all over the tumour. As the uterine souffle simply means enlarged uterine arteries, there is no souffle when these are not enlarged; hence it is absent in subserous fibroids with a small pedicle. *Vaginal examination.*—Should the tumour be large and lift the uterus into the abdomen, the cervix will be high up; or it may be displaced in various ways, according to the position of the tumour; it has a firm consistence. *Bimanual.*—With pedunculated subserous fibroids, the uterus is felt distinct from the tumour; with interstitial and submucous, we simply feel a large mass continuous with the cervix. *The Sound.*—This should not be used till all possibility of pregnancy has been excluded. In doubtful cases, we wait three or four months till the positive signs indicative of pregnancy should have had time to develop. From the use of the sound we learn (1) the length, (2) the direction of the uterine cavity. The length of the cavity is always increased in submucous, and generally in interstitial, but not in subserous tumours; it may measure six or eight inches. The direction of the canal is often tortuous in submucous tumours; hence the passage of the sound is difficult, sometimes impossible. We feel that the sound goes so far and then catches on a hard projection. In such cases, a soft (No. 8) bougie is very useful, as its flexibility allows it to pass the obstruction.

Differential Diagnosis.

Large fibroid tumours require to be diagnosed from—

Advanced pregnancy,
Ovarian tumours,
Extra-uterine gestation,
Hæmatocele and inflammatory deposits.

In *advanced pregnancy* the uterus is of softer consistence, and shows ballottement—the indication of a solid within a fluid; further, we can feel the parts of the fœtus. It becomes occasionally harder under the hand, especially if we make the patient change her position; this *variation in consistence* is a most valuable diagnostic, as it is rarely present in fibroid tumours. We hear the uterine souffle and, unless the child be dead, we hear in addition the *fœtal heart*; the possibility of the child's being dead should always be kept in mind. On vaginal examination, there is discoloration of the vaginal walls with free secretion; the cervix is softened. There is usually amenorrhœa corresponding in duration to the size of the uterus.

The diagnosis is not so easy as it appears on paper; witness a case[1] in which abdominal section was about to be done in a case of four months' pregnancy, which was not recognised, on the most careful examination, until the patient was under the anæsthetic. Such a case shows the necessity, in doubtful cases, of anæsthesia even for examination.

Ovarian tumours are soft and elastic; small ones may be firm. There is no uterine souffle. They only give rise to difficulty in diagnosis when they have become adherent to the uterus, and move along with it. It is sometimes impossible to diagnose between them and cystic fibroid tumours (*v.* Fibro-cystic Tumours).

Extra-uterine gestation presents great difficulty in diagnosis, especially when the gestation is in an undeveloped horn of the uterus. This condition may so closely simulate a fibroid that it may not be diagnosed till Abdominal Section has been made (*v.* p. 284).

In *hæmatocele and inflammatory deposits* we have the history of the attack to guide us. It may be impossible to form a diagnosis on first examination; but after watching the case for a few weeks and noting any change in the deposit in addition to ascertaining its precise situation, we can form a diagnosis. The determination of the amount of leucocytosis (*v.* p. 180) is sometimes of service. Pelvic peritonitis frequently occurs round a subperitoneal fibroid, or any fibroid producing pressure; and in such a case it is impossible to diagnose between the tumour and the effusion round it. Many cases reported of gradual absorption of a fibroid tumour under treatment were probably cases of mistaken inflammatory exudation.

PROGNOSIS.

In forming our prognosis we must take into account (1) the site of the tumour in the uterus, most favourable when subserous; (2) its position in the pelvis, whether low down and likely to become wedged within it; (3) the symptoms already present, of which *hæmorrhage* is the most important; (4) rapidity of growth, which by itself may form a reason for interference. In only about one in three thousand cases does a fibroid tumour prove fatal (Roger Williams).[1] Though (as already said) they are rarely dangerous to life, they may incapacitate for work, and cause the patient many years of suffering from which she only finds relief at the menopause, and not always then.

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[1] Brit. Med. Journ., 1886, ii., p. 474.

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[1] Based on the Registrar-general's statistics for 1901, in which 339 deaths are attributed to uterine myomata out of a population of 17 million females, the frequency of uterine fibroids being calculated at 20 p. c. for women of over thirty-five years of age (Brit. Med. Jour., 1904, Vol. I., p. 461).

CHAPTER XXXVII.

FIBROID TUMOURS OF THE UTERUS: TREATMENT.

LITERATURE.

Atlee—The treatment of the fibroid tumours of the uterus: Internat. Med. Cong. Trans., Sept. 1876. *Bantock*—British Medical Journal: 1881, p. 426. *Bigelow*—Gastrotomy for Myofibroma of the Uterus: Amer. Jour. Obstet., Nov. and Dec. 1883, Jan. to March 1884. *Duncan, Matthews*—Diseases of Women: London, 1883, p. 289. *Fritsch*—Sechzig Fälle von Laparomyomotomie mit epikritischen Bemerkungen über die Methoden dieser Operation: Volk. Samml., No. 339. *Greenhalgh*—On the use of the actual cautery in the enucleation of fibroid tumours of the uterus: London, Med. Chirurg. Trans., Vol. lix. *Haultain*—The Treatment of Uterine Fibro-myomata: Ed. Med. Jour., 1903, p. 193. *Hegar u. Kaltenbach*—Die operative Gynäkologie: Stuttgart, 1881, S. 416. *Hofmeier*—Die Myomotomie: Stuttgart, F. Enke, 1884. *Keith*—Surgical treatment of tumours of the abdomen: Edinburgh, 1885. On Supra-vaginal Hysterectomy, with remarks on the principle of the Extra-peritoneal method of treating the pedicle: Brit. Med. Journ., Dec. 8, 1883. Thirteen cases of Hysterectomy, with remarks on Carbolic Acid Spray in Abdominal Surgery: Brit. Med. Jour., Jany. 31, 1885. *Kelly, Howard, A.*—Operative Gynecology: Henry Kimpton, London, 1898. *Leblond*—Traité élémentaire de Chirurgie gynécologique: Paris, 1878. *Martin*—Pathologie und Therapie der Frauenkrankheiten: Wien und Leipzig, Urban und Schwartzenberg, 1887. *Palmer*—Laparotomy and Laparo-Hysterotomy, their indications for fibroid tumours of the uterus: Americ. Gyn. Trans., 1880. p. 361. *Pozzi*—Traité de Gynécologie: Paris, 1897, p. 287. *Schroeder*—Handbuch der Krankheiten der weiblichen Geschlectsorgane: Leipzig, F. C. W. Vogel, 1886. *Simpson, A. R.*—The treatment of fibroid tumours of the uterus: Contributions to Obstetrics and Gynecology, Edinburgh. 1880. *Sims, Marion*—On intra-uterine fibroids: New York Medical Journal. April 1874. *Thornton*—Cases of Hysterectomy, with remarks on the value of the Carbolic Acid Spray in the operation: Brit. Med. Journ., May 23, 1885. Article—"Hysterectomy" in Allbutt and Playfair's System of Gynecology: London, 1896. *Wells, Spencer*—On Ovarian and Uterine Tumours, etc.: London, 1882. *See* also references in the text.

THIS is best considered under the heads of the treatment of symptoms and the removal of the tumour. It must be borne in mind, especially since the operative treatment of fibroid tumours has come into such prominence, that the large proportion of myomata are symptomless and do not call for treatment. Further, when symptoms are present, of which the most important is hæmorrhage, palliative treatment will often give relief. Under palliative treatment we include the use of ergot and other medicines to control hæmorrhage, electricity, and the minor operation of curetting; in this category also we would place the removal of the uterine appendages, which, although it is a major operation, is not a radical one.

Ergot in Fibroids.

The most frequent symptom of a uterine fibroid is menorrhagia, and this can be often controlled by the administration of medicines, of which the most valuable is *ergot.* Its beneficial results in the treatment of uterine fibroids were first brought forward by Hildebrandt [1] and A. R. Simpson. In addition to controlling the menorrhagia it checks the nutrition of the tumour by diminishing its blood supply, and if it be submucous favours its pedunculation and expulsion. Ergotin is more active than the liquid extract, and may be given in pill, suppository (4 gr. in each), or in serious hæmorrhage, hypodermically. The formula for hypodermic use, recommended by A. R. Simpson is—

R	Ergotini	ʒii.	
	Aquæ	ʒvi.	
	Chloral-hydratis	ʒss.	M.

Three grains of ergotin are contained in 12 minims of the fluid, which is the usual dose. Chloral is added to make the solution keep, but even with this it soon becomes unfit for use, and requires to be made up repeatedly.

Hydrastis Canadensis,[2] fifteen minims to one drachm of the tincture or up to four drachms of the liquid extract, is sometimes used instead of ergot; it does not disturb the digestive system by causing constipation as ergot may do.

Adrenalin chloride (10 to 20 min. of 1 in 1000 solution), a preparation from the supra-renal gland, has been recently used with advantage here, as in other forms of hæmorrhage.

When the patient can afford it, benefit is derived from a course of treatment of *mineral waters* (such as those of Kreuznach) as recommended for chronic metritis.

The symptoms due to the weight of the tumour may be relieved by *artificial support.* Thus patients with a small fibroid often derive great benefit from wearing a Hodge pessary; the discomfort of a large abdominal tumour is materially lessened by wearing a broad flannel bandage.

When the tumour nearly fills the pelvis and is beginning to press injuriously upon the bladder and rectum, we should, when possible, *push it up out of the pelvis* into the abdomen; this is done before the occurrence of pelvic peritonitis, which may hopelessly bind it within the pelvis. The most favourable case for this manipulation is a subserous fibroid with a distinct pedicle.

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[1] Berl. klin. Wochenschrift, 1872, No. 25.

[2] Rutherford gives five cases treated by it—it controlled hæmorrhage, but had no effect on size of tumour. Brit. Med. Journ., 1888, ii., p. 123.

TREATMENT OF FIBROIDS BY ELECTRICITY.

More than twenty years ago, Tripier of Paris treated uterine fibromata with Faradisation, and as far back as 1867 Althaus wrote in the *British Medical Journal* on the electrolytic treatment of tumours;[1] while in America in 1870, Cutter[2] began to use galvanism in the treatment of fibroid tumours. It is, however, to Apostoli that the credit is due of elaborating the electrical treatment of fibroids and bringing it prominently forward before the profession.[3]

Electricity in Fibroids.

The technique will be more fully described in the chapter on Electricity in the Appendix. Here we need only say that the internal electrode consists of a platinum rod the thickness of a uterine sound, sheathed in a vulcanite tube except over the portion within the uterus. The external electrode consists of a sheet of lint or chamois leather soaked in a solution of sodium chloride; this is laid on the abdomen and on it rests a copper or leaden plate connected with a battery wire. The internal electrode is usually negative unless hæmorrhage is the chief symptom, in which case it is made positive on account of the hæmostatic action of that pole. The current strength used varies from 70 to 100 milliampères for the first application, increased afterwards to 200 or even 250 milliampères.

Electricity has now come to have a recognised place in the treatment of fibroids although there is still great divergence of opinion as to its value. It is a noteworthy fact that Keith, who had as great success as any operator in the removal of fibroid tumours by abdominal section, said—

> "Apostoli's treatment puts a woman with a fibrous tumour who suffers much into the position of a woman with a fibrous tumour who does not suffer or may be even unaware of its presence. It does not bring about the disappearance of the tumour, or it does so very rarely, but size is lessened more or less—one-half, one-third, two-thirds. . . . What I now plead for is, that for a time all bloody operations for the treatment of uterine fibroids should cease, and that Dr Apostoli's treatment as practised by him should have a fair trial."[4]

The diminution in size of the tumour of which Keith speaks has not, however, been found to be so constant a phenomenon that it can be counted on. Dr Milne Murray, who gave much attention to electricity in gynecological therapeutics and the improvement of the operative technique, wrote as follows[1]:—

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[1] See letter by Althaus in the British Medical Journal, 1887, i., p. 1364.

[2] Amer. Journ. Obs., 1888, p. 384.

[3] In his paper read at the Dublin meeting of the British Medical Association in 1887, "On the Treatment of Fibroid Tumours of the Uterus by Electricity with Observations and Complete Statistics of all the Cases so treated from July 1882 to July 1887."—Brit. Med. Jour.., 1887, ii., 699. In the Lancet, April 6, 1889, he records 278 cases of fibromata or hypertrophy of the uterus treated by his method, and says as to results, "I can affirm that when there has been no negligence, and my advice has been fully acted upon, ninety-five times out of a hundred permanent benefit has been acknowledged." His Travaux d'Electrothérapie Gynécologique: Paris, 1894, contains translations of the chief contributions to the literature of this subject in different countries. While these all agree as to the benefit derived from checking hæmorrhage and especially improving nervous tone, its effect as regards diminution of the tumour is only occasional, and in causing its disappearance exceptional. As to its possible harmful effects on reproduction, he has published eighty cases in which pregnancy followed—Suites éloignées du traitement électrique conservateur en gynécologie; grossesses consécutives: Arch. d'électr. méd. Bordeaux, pp. 233, 282.

[4] Brit. Med. Journ., June 8, 1889.

> "It is not alleged that tumours are necessarily dispersed or materially diminished in bulk by electrical treatment, however long or energetically carried out; that both these events happen from time to time is no doubt true, but the symptomatic cure which is claimed as the aim and result of this treatment does not depend on the disappearance or even on a considerable diminution of the tumour. To those who have had even a moderate experience of this method, it is known that a tumour which was a menace to life may cease to give any inconvenience without undergoing any appreciable diminution in size."

So also Steavenson, who had charge of the Electrical Department of St. Bartholomew's Hospital, says[2]—

> "In my paper referred to (St. Bartholomew's Hospital Reports), I have said that compared with other methods it is probably the best short of actual operation.' I have admitted that the results are not so brilliant as we could have wished, or as we were led to hope they would be. All the palliative modes of treatment of uterine fibroids are eminently unsatisfactory, and the profession would have hailed with delight any mode of treatment that would have promised a cure. This certainly electricity does not accomplish, at any rate with tumours of any size; but there is no doubt that in the majority of cases the symptoms are relieved, and one of the most troublesome that yields to electrical treatment is that of hæmorrhage. Improvement will also take place under the administration of ergot and by the imbibition of the iodo-bromine waters of Kreuznach and Woodhall Spa. . . . It certainly is a question whether in their case (*i.e.*, hospital patients) the advantage obtained by the electrical treatment is sufficiently great over other modes of treatment as to call for the expenditure of the time and trouble necessary for carrying it out."

Results of Electrical Treatment of Fibroids.

While exceptionally, diminution and even disappearance of the tumour has been noted,[3] the application of electricity to fibroids is in great measure a *treatment of symptoms*, and hence it finds its place under the symptomatic treatment of these tumours.

For results of cases the following papers may be consulted.

P. F. Mundé—My recent experience with electricity in Gynecology: Amer. Jour. Obstet., June 1890. *W. Fraser Wright*—Gynecological Cases treated by electricity in Professor Simpson's Clinique: Edin. Obs. Trans., 1889-90, p. 58. *Engelmann* records nine cases with, in some instances, diminution of the tumour, but thinks he has got better results from ergotine than baths (Wien Klin. Woch., 1890, No. 27). *Massin* gives the result of the treatment of the twenty-three cases in Slavjansky's Clinique. (*See* French translation of his paper in Apostoli's Travaux d'Electrothérapie, p. 356.) *Murray, R. Milne*—(twenty-four cases of fibroids) On the treatment of pelvic disease by electricity, with table of forty-five cases grouped according to symptoms: Edin. Obs. Trans., 1889-90, p. 120. *Mandl* and *Winter*—Report on ninety-four cases treated by electricity in Chrobak's Clinique, of which seventeen were fibroids. Zur gynecologischen Therapie: Wien Klin. Wochen, 1891, S. 955, 983; and 1892, S. 50, 70. *Kellogg*—(sixty cases of fibroid tumours) Summary of my personal experience with electrolysis in treatment of fibroid tumours: Jour.

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[1] "The Electrical Treatment of Diseases of Women" in Allbutt and Playfair's System of Gynecology: London, 1896, p. 326—a monograph specially valuable for its clear description of the necessary appliances, practical directions as to their use, and well-balanced opinion as to the results, claiming neither less nor more for this treatment than facts warrant.

[2] Lancet, April 6, 1889.

[3] As by Milne Murray, in which a fibroid as large as a six months' pregnancy disappeared after forty applications (Edin. Obs. Trans., 1893-94, p. 118); and by Parsons who records a similar case (Brit. Gyn. Jour., 1892-93, p. 338). So also Kjoergaarch records disappearance of a tumour the size of a hen's egg: Apostoli's Travaux d'Electrothérapie, p. 585.

Amer. Med. Assoc., 1892. *Parsons, J. T.*—Twenty cases of fibroma and other morbid conditions of the uterus treated by Apostoli's method: Lancet, 1892, Vol. i., p. 467. *Haultain, F. W. N.*—(twenty-two cases of fibroids) The electrical treatment of uterine fibroids and subinvolution: Edin. Obs. Trans., 1893-94, p 210. *Corson, E. R.*—(nine cases of fibroids) The Apostoli treatment of uterine fibroids: Amer. Jour. Obst., 1895, Vol. ii., p. 341.

Curetting of the uterus is also a useful means of checking hæmorrhage. The uterine mucosa, as we have seen, undergoes changes which favour hæmorrhage. The cases suitable for curetting are, however, limited, owing to the distortion of the uterine cavity which may be present, and which prevents efficient use of the curette. Atmokausis has been used for the same purpose.

Removal of ovaries or of uterine appendages.—The removal of these, as we have seen (*v.* p. 232), usually stops menstruation and induces the menopause; hence in the case of fibroid tumours it does good in two ways—by checking bleeding and stopping the growth of the tumour. As the operation is a less serious one than hysterectomy, it promised at one time to have a wide field in the treatment of myoma; but experience has shown that it is often impossible to get at both ovaries, at least in the cases of large myomata, and the results have not always been satisfactory. It will always, however, have its place in the case of small tumours, especially where the patient is unwilling to face the major operation.

We pass now to the radical treatment of uterine fibroids, or *removal of the tumour.*

Indications for Operation.—As to what cases should be operated on there is difficulty in laying down definite rules. Each case must be judged on its own merits, for we are here dealing with a tumour of a different category from an ovarian tumour or cancer, where the mere fact of the presence of the neoplasm calls for its removal. A case of uterine fibroid has often been under observation for some time before the necessity of operation becomes evident. We may say generally that operation is called for in large tumours which cause discomfort or pressure symptoms, or interfere with the patient's occupation; in small tumours which, through impaction in the pelvis, are causing pressure symptoms; in rapidly growing tumours, which on this account are likely soon to be troublesome, though there are no urgent symptoms at present; where pain or attacks of inflammation with pyrexia point to necrotic changes in the tumour, or to changes in the uterine appendages; and where persistent uterine hæmorrhage is affecting the patient's strength, and has resisted all other forms of treatment.

Surgical Treatment of Uterine Fibroids.

While the radical treatment of fibroid tumours includes the removal of pedunculated submucous tumours, as polypi, and the enucleation of small interstitial ones, the chief interest gathers round the treatment of those larger interstitial tumours, the removal of which implies the amputation of a portion of the uterus. The development of the operative technique for this is one of the most interesting subjects in operative gynecology.

Historical Sketch.

The operative treatment of fibroids has followed step by step that of ovarian tumours, which here led the way. The abdomen was first opened for a fibroid, by mistake for an ovarian, by Lizars in 1825; but at that time the extirpation of these tumours was not thought of. Success however in the removal of ovarian tumours encouraged the operator to proceed with fibroids, and in 1837 Granville successfully removed a pedunculated subserous tumour. The first deliberate hysterectomy for an interstitial fibroid was done by Kimbal in 1855, but it was Kœberlé and Péan who, by their operative methods and success, secured for the operation a recognised place.

As in ovariotomy, the pedicle was first treated extra-peritoneally, because the size of the uterine stump and the difficulty of controlling hæmorrhage from it made operators hesitate to drop the pedicle into the abdomen. It was kept outside the abdominal wound in a clamp.[1] As this required to be tightened from time to time, the use of an elastic ligature[2] and then of the serre-noeud[3] (a small wire ecraseur which could be tightened up as the pedicle sloughed off) marked the next stages in advance. To shut off this sloughing mass from the peritoneal cavity was the great difficulty—in saving the patient from the risk of hæmorrhage she was exposed to the danger of sepsis; and if both these difficulties were overcome a wound was left which took weeks to close. Still the results of dropping the pedicle into the peritoneal cavity were so unsatisfactory that up to ten years ago the extra-peritoneal was still the recognised method. The explanation of the bad results of the intra-peritoneal method[4] was that the cervix was tied en masse, which led to sloughing of tissue, and the stump was not completely shut off from the peritoneal cavity.

The great advance of the last ten years, which has made the operation of hysterectomy for fibroids, in an uncomplicated case, as safe for the patient as ovariotomy, has been the ligature of the uterine arteries separately, and the formation of peritoneal flaps, so as to keep all ligatured tissue outside the peritoneal cavity.

On looking into the pelvis after hysterectomy is completed, nothing is seen except the line of opposed peritoneal surfaces running across the pelvic floor (Pl. XI., fig. 4); the stump and all raw surfaces are retroperitoneal; there are all the advantages of extra-peritoneal treatment, and none of its risks.

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[1] As was done by Keith, who had the most remarkable results by this method—mortality of 15·7 p. c. in hospital, and only 3·8 p. c. in private practice (Brit. Med. Jour., 1887, p. 1257).

[2] The elastic ligature was introduced by Kleeberg and elaborated by Hegar, who emphasised the importance of careful adaptation of the peritoneum round the extra-peritoneal pedicle.

[3] The serre-noeud of Cintrat met with great success in the hands of Péan, while Kœberlé's instrument was the favourite one with British operators, such as Bantock, Thornton, and Lawson Tait.

[4] Intra-peritoneal treatment of the pedicle was first advocated by Schroeder, and improvements in technique have deen brought forward by Fritsch, Leopold, Zweifel, and especially Martin, in Germany; by Doyen, Segond, and Pozzi, in France; and Baer, Goffe, Stimson, Noble, and Kelly, in America.

Fibroid tumours may be removed by the abdominal or the vaginal route. Owing to the size of the tumours and the improved technique in abdominal section, the vaginal route is not much used in this country, except in the removal of polypi. Where the cervix is removed with the uterus the vagina is, of course, cut into, and certain manipulations may be done per vaginam, so that pan-hysterectomy is a combined abdomino-vaginal operation, and the vagina must be made as aseptic beforehand as the abdomen. We consider first the more important treatment of fibroids by abdominal section. Here we have to consider myomectomy, in which the tumour alone is removed; hysterectomy, where the uterus is removed with the tumour, amputation being usually made through the isthmus;[1] and pan-hysterectomy, in which the whole uterus, body and cervix, is excised. Whether the ovaries should be removed with the uterus is open to discussion. Frequently they are diseased; but if healthy it is better to leave at least one, as there is less general disturbance after operation, and they may be of use in providing an internal secretion (*v.* p. 28).

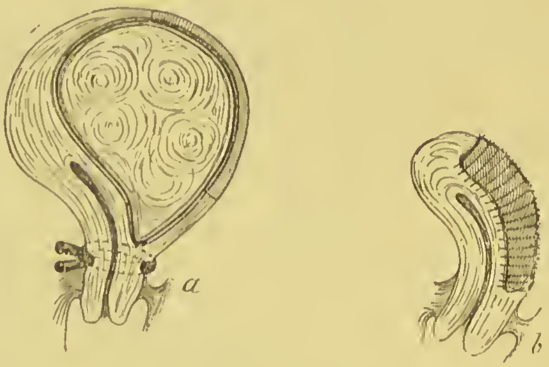

FIG. 226.

MARTIN'S OPERATION FOR ENUCLEATION OF FIBROID FROM WALL OF UTERUS (*Martin*).

a. Shows uterus with temporary elastic ligature round it; the shaded portion of capsule being the extent of incision in it. *b.* Shows how the hollow in uterine wall is closed by sutures.

In *myomectomy* the tumour is removed and the uterus left. In the case of a subserous, pedunculated tumour, the tumour is amputated and the pedicle sewn up. The uterus is grasped firmly, just at the pedicle, by an assistant, to control hæmorrhage; an incision is made round the pedicle, a short distance from its uterine attachment, so as to leave room for approximating the cut surfaces. All bleeding points are secured by transfixion; the fleshy part of the pedicle is closed in by deep interrupted sutures, and the peritoneum by a continuous superficial one.

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[1] Strictly speaking, this is not hysterectomy, as the whole uterus is not taken away.

Small interstitial tumours may be enucleated from the uterine wall.[1] A long incision is made through the peritoneum and capsule of the tumour, so as to expose the dense white tissue of the tumour. This is seized by a pair of strong volsella, and shelled out of its bed with the fingers or handle of the knife. Should the uterine cavity be opened into it is swabbed carefully out, care being taken not to bring its contents over the raw surface. The wound in the uterus is closed by deep interrupted sutures, which do not pass through the uterine mucosa if its cavity should have been cut into. If the tumour is large it may be necessary to throw a temporary elastic ligature round the uterus (*v.* fig. 226).

ABDOMINAL HYSTERECTOMY FOR FIBROIDS.

Under this head we have to consider the removal of the body of the uterus along with the tumour by supra-vaginal amputation—*hysterectomy*, and how the operation is modified when the cervix also is removed—*pan-hysterectomy.*

To understand the technique some anatomical points must be noted with regard to the blood supply, the peritoneum, and the cervix. From Plate III. it is evident that the *blood supply* comes from two sources, the ovarian and the uterine arteries, and that a small branch derived from the epigastric runs down the round ligament. If the ovary is to be removed, the ovarian artery with its veins is controlled by tying the infundibulo-pelvic ligament (compare Pl. I., where it is seen entering the broad ligament at this point). If the ovary is left, the vessel is tied between the ovary and the uterus. The uterine artery is tied where it comes into relation with the uterus at its lower angle, and before it gives off its branches to the cervix (compare Pl. III). Its relation to the ureter, which passes beneath it here, must be borne in mind (*v.* fig. 227). The round ligament is tied separately to control the small vessels upon it. The *peritoneum* is loosely attached over the bladder and lower third of the uterus, and a flap can be got easily anteriorly. Posteriorly it is more adherent, and cannot be stripped off the uterus to any distance. When the uterus is amputated at the os internum, the *cervical canal* will be exposed in the middle of the stump. The normal canal is germ-free, and can be shut off by approximating the muscular wall outside it.

The patient is prepared as for an abdominal section, with the addition that the labia are shaved and the vulva and vagina made thoroughly aseptic, in case the cervix has to be removed. The abdominal incision is made as usual, coming as close down to the pubes as possible, its upper limit being determined by the size of the tumour. On the tumour being exposed the patient is put in the Trendelenburg posture, and the myoma-screw (*v.* fig. 228) screwed into the tumour to draw it out through the incision. A large swab is placed behind the uterus to prevent any blood passing into the abdominal cavity. The operation may be described under the following five steps.

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[1] An operation introduced by Martin of Greifswald: Centralb. f. Gyn., July 1886.

1. *The round ligaments and uterine appendages are tied off* on both sides with fine silk (Pl. XI., fig. 1). This may be carried through by Olshausen's needle (fig. 131), or by passing through a pair of sinus forceps, by which the ligature is afterwards drawn through; the advantage of forceps is that by opening them the puncture in the ligament can be widened bloodlessly before the ligature is drawn through. The ovarian vessels are controlled by ligaturing the upper portion of the infundibulo-pelvic ligament; the round ligament is tied separately. After ligaturing these, the tissue is seized on its uterine side with forceps half an inch from the ligature, so as to control reflux of blood from the tumour, and the tissue divided between.

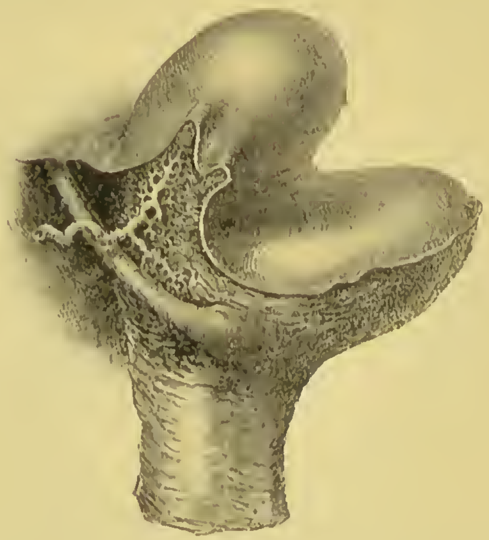

FIG. 227.
RELATION OF URETER TO UTERINE ARTERY (*Kelly*).

2. *The peritoneal flaps are made* as follows: An incision through the peritoneum only is made along the line shown in Pl. XI., fig. 1, a little below the insertion of the round ligaments, the lower cut edge is held up in forceps, and the peritoneum with the bladder beneath it, is separated off from the uterus by the handle of the knife, or sponged off with a swab. A convenient way of making this flap is by pushing a pair of closed, probe-pointed scissors, curved on the flat with the concavity

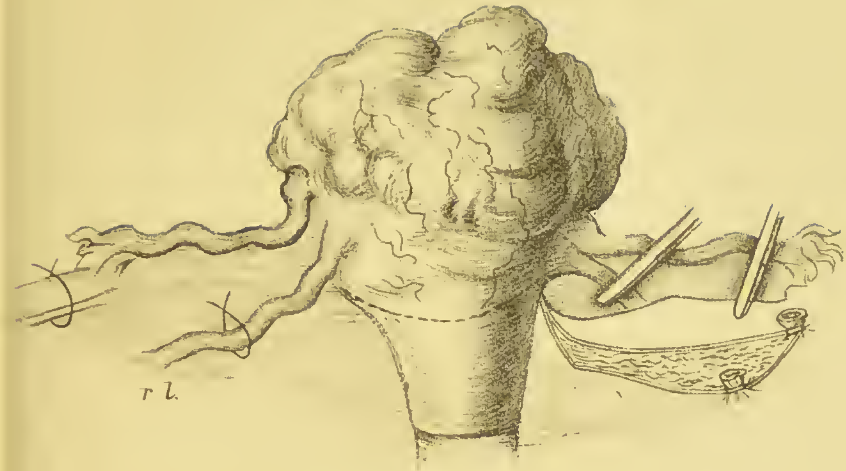

Fig. 1.

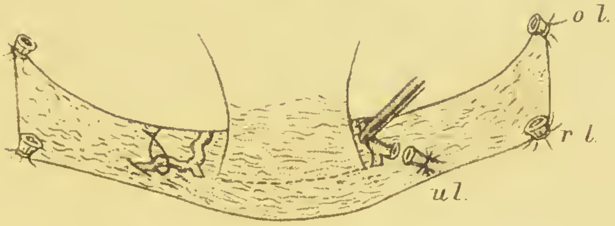

Fig. 2.

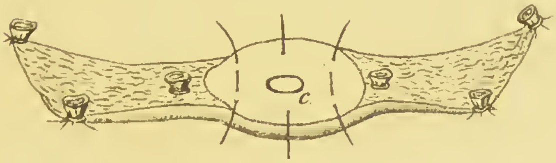

Fig. 3.

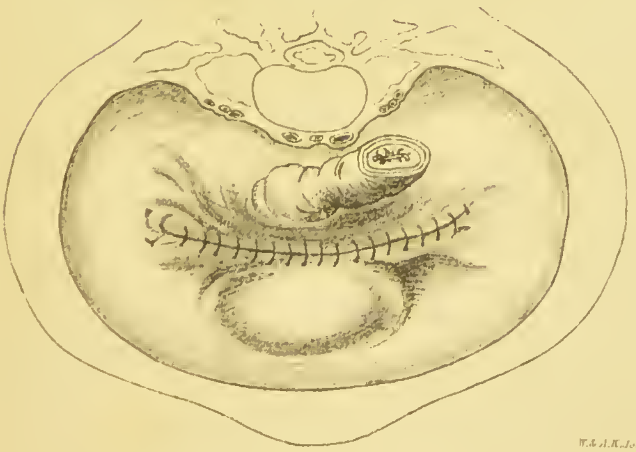

Fig. 4.

W. & A. K. Johnston Limited

HYSTERECTOMY FOR FIBROID TUMOURS OF THE UTERUS.

FIG. 1. Ligature of Infundibulo-pelvic and Round Ligaments, with line of Anterior Peritoneal Flap: right side, position of ligatures (*o*, ovarian artery; *rl*, round ligament); left side, ligatures tied. Forceps applied to prevent reflux, and broad ligament divided.

FIG. 2. Ligature of Uterine Artery: right side, seat of ligature; left side, ligature tied and uterine artery cut. Dotted line shows level of amputation (*ol*, ovarian artery ligature; *rl*, round ligament ligature; *ul*, uterine artery ligature).

FIG. 3. Stump after amputation, seen from above: Sutures passed, but not tied. *c*, Cervical canal.

FIG. 4. Appearance of Floor of Pelvis after Peritoneal Flaps have been united.

towards the uterus under the peritoneum of its anterior surface, where the round ligament has been tied off, on one side. The peritoneum is easily separated without tearing, with the closed scissors, which are afterwards used to cut the flap. In making the posterior flap the knife only can be used, on account of the more intimate attachment of the peritoneum; beginning on the same level as in front, the knife is carried across the posterior aspect of the uterus to a corresponding point on the opposite side, the lower cut edge of the peritoneum is laid hold of with forceps and stripped down by blunt dissection. The incision through the peritoneum is on a rather lower level posteriorly, and the flap is shorter; the firmer attachment of the peritoneum makes its separation difficult, and all that is required is a sufficient breadth of peritoneum to stitch the anterior flap to.

3. *Ligature of the uterine arteries and amputation of the uterus.*—These go together. By pushing down the peritoneum at the side of the uterus with a swab the broad ligament is opened up and the uterine artery exposed; if not seen it can be felt pulsating between the finger and thumb. A ligature is passed below it so as to include only it and the accompanying veins. Care should be taken to tie it before it gives off a branch running downwards towards the cervix (*v.* Pl. III.), otherwise there will be bleeding from the stump when the uterus is amputated; the relation of the ureter must be kept in mind so as not to include it in the ligature (*v.* fig. 227). The artery with its veins is seized on the uterine side with forceps half an inch from the ligature, so as to control reflux of blood when the tissue between is divided. When this has been done on one side the uterus can be amputated through the isthmus, the uterine artery on the other side being tied when it is come upon just before the amputation is completed, or caught up in forceps and then ligatured (fig. 230). Or the uterine artery may be found and tied on both sides first, and the uterus then amputated.

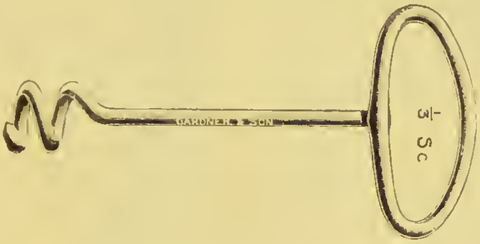

FIG. 228.

MYOMA-SCREW for drawing out uterine fibroids.

4. *Sewing up of uterine stump.*—This is a flat surface and must be folded on itself. Three interrupted sutures are passed as in Pl. XI. fig. 3 to draw in the edges; sometimes it is necessary to cut a wedge-shaped piece out, so as to allow the faces of the stump to come together. These

sutures of medium silk or catgut are best passed with a stout full-curved needle, as the tissue is dense; some prefer a continued to interrupted sutures.

5. *Stitching of peritoneal flaps.*—Long toothed forceps are useful for holding up the peritoneal edges, and drawing them together. Doyen's abdominal retractor (fig. 229) is of service in keeping the field of operation exposed right across the pelvis. The suture is of fine silk or catgut, and long enough to go across the pelvis. After tying the knot to fix the end of the suture the free end of the thread is caught in forceps, but not cut off at the knot until the suturing of the peritoneum is completed, as it is of use in keeping tension on the parts. The needle is passed in and out on the peritoneal side about a quarter of an inch from the cut edge, first of one flap, then of the other, so as to cause inversion of the peritoneal margin when the suture is drawn tight. Special care is required to tuck in the round and broad ligament ligatures at the outer angles. This is done by passing the needle through the pedicle below the ligature. Before bringing together the peritoneal flap we must make absolutely sure that the stump is perfectly dry, and that there is no oozing into the cellular tissue at the base of the broad ligaments. Any clot forming below the flap is a nidus for sepsis. The patient is now put horizontal to allow the intestines to come back into the pelvis, and a swab placed below the abdominal wound while it is being stitched up. For closure of wound, *see* chapter on Abdominal Section.

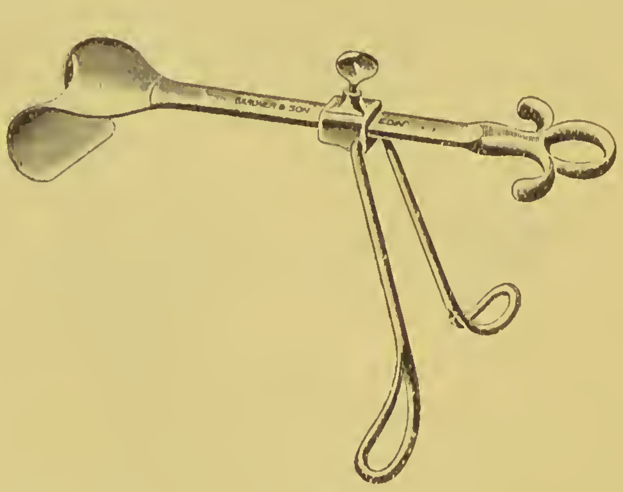

FIG. 229.

DOYEN'S ABDOMINAL RETRACTOR. The blade is inserted in the lower angle of the abdominal wound, so as to make it gape transversely, and expose the whole breadth of the pelvis. The limbs of the carrier are passed under the patient's thighs, and the handle slipped in and fastened by the screw.

Instead of tying off the upper portions of the broad ligaments on both sides first, as we have described, Kelly ties the vessels in one ligament, then the uterine artery of the same side, amputates the cervix, catches up the uterine of the other side, and then divides the round ligament and upper part of the broad ligament of the other side, clamping or tying the vessels as he goes (*v.* fig. 230).

The steps in the operation of *pan-hysterectomy* are the same up to the point when the uterine arteries have been tied and the cervix amputated.

A pair of forceps is then introduced *per vaginam*, and pushed up into the posterior fornix, and cut down on, inside the posterior peritoneal flap. The opening is enlarged so as to free the cervix behind, which is then laid hold of with strong volsellæ or Doyen's hook-volsella, and pulled up through the rent, so as to allow the operator to get access to the mucous membrane of the vagina which is divided all round. The bladder is separated from below upwards,[1] and any bleeding points caught in forceps and afterwards ligatured.

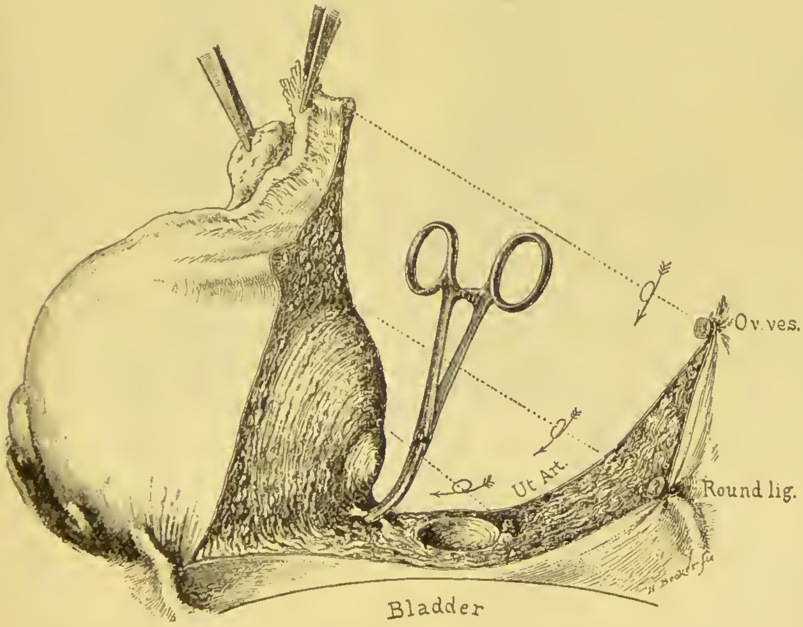

FIG. 230.

HYSTERO-MYOMECTOMY BY KELLY'S METHOD (*Kelly*). By a continuous incision from left to right, tying or clamping at the points indicated by the arrows ; first, the left ovarian vessel, (*Ov. Ves.*) ; next, the round ligament, and then the left uterine artery, (*Ut. Art.*). Finally, the cervix is cut across, and the uterus pulled away until the right uterine vessels are exposed.

Instead of pulling the cervix up through the rent, so as to see the fornix from below, the bladder may be separated from above downwards, and when the anterior fornix is reached it is opened into by cutting on the finger tips of the other hand, which are passed through the rent in the posterior fornix as a guide. The cervix being thus set free before and behind, the base of the broad ligaments and lateral fornices are clamped temporarily (*v.* fig. 230*) and the uterus and tumour cut away. The clamps are now removed and any bleeding points ligatured.

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[1] The separation of the bladder from below upwards, which is made possible by bending the cervix on itself upwards through the incision in the posterior fornix, is a method which we owe to Doyen of Paris. Hysterectomie Abdominale et Vaginale : Paris, 1892, p. 72.

After the removal of the cervix the forceps are again pushed up through the rent in the vaginal roof, so as to lay hold of iodoform gauze which is drawn in from the abdominal side until it emerges at the vulva. It is then packed gently into the rent in the vaginal roof, cut short, and the peritoneum adapted over it; by this means a small gauze tampon is left in the opening in the vaginal roof, which is removed subsequently (two days after the operation) by traction on the end projecting at the vulva. The rent in the vaginal roof may be

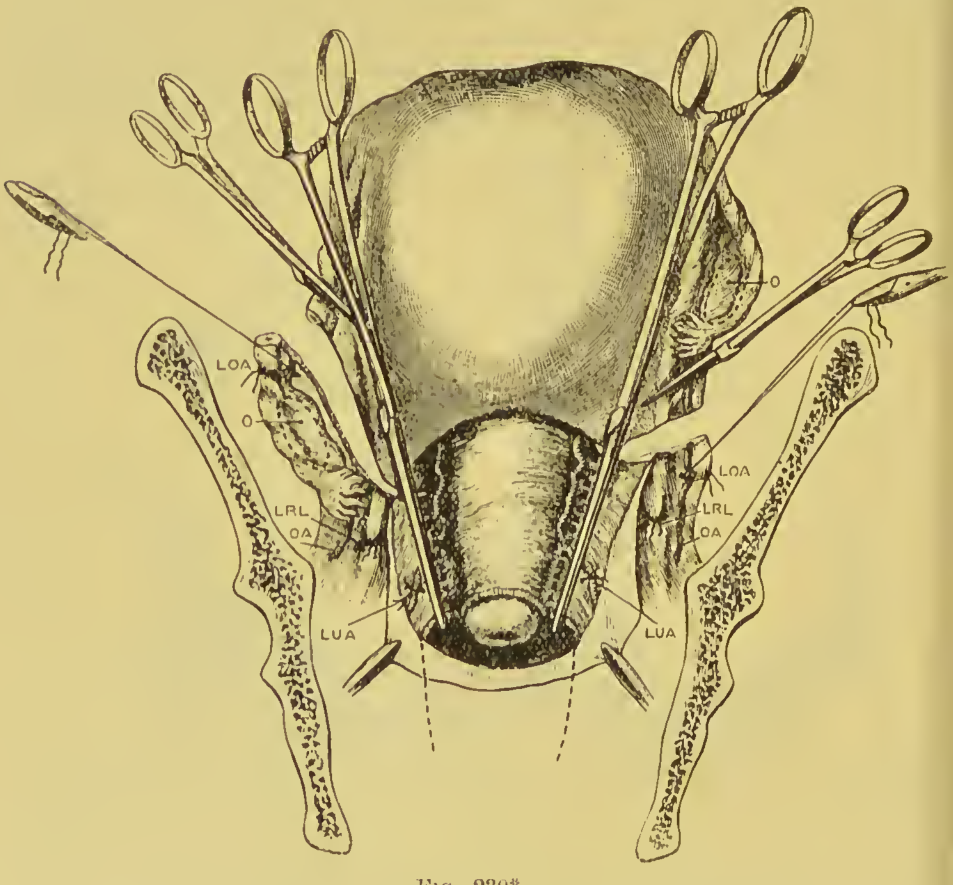

FIG. 230*.

ABDOMINAL HYSTERECTOMY SEEN FROM THE FRONT (*Galabin*).

The left ovary (*O*) is removed with the tumour, but the right not taken away; the ovarian artery (*O A*) has been ligatured (*L O A*) also the round ligament (*L R L*), and the broad ligament divided, its edge being held up by a suture which is left long for this purpose; the anterior flap of peritoneum is dissected off and drawn down with forceps; the uterine artery has been ligatured (*L U A*), and after the anterior and posterior fornices have been opened, a temporary clamp has been placed on the remaining parts of the broad ligaments, previous to the amputation of the uterus along the dotted line.

reduced by stitching the vaginal mucosa together at the sides, leaving only sufficient space in the centre for the strip of gauze to pass through.

The operation of hysterectomy is a simple one when the tumour is situated high up, and does not disturb the anatomical relations. It becomes increasingly difficult when the myoma extends below the vesical peritoneum, or into the broad ligament, or twists the uterus round so that the vessels are displaced. Where multiple myomata extend under the pelvic peritoneum on all sides, and displace the ureters, the operation is exceedingly difficult.[1]

OPERATIONS BY THE VAGINAL ROUTE.

Removal of Polypi.

1. The removal of a fibroid tumour which has become *pedunculated* is a comparatively simple operation, and will be considered under the treatment of fibrous polypi.

Enucleation.

2. The removal of a non-pedunculated submucous fibroid by *enucleation* is an operation which has a very limited range. The danger of sepsis, and the introduction of other methods, has restricted its use to the few cases which cannot be treated by hysterectomy.

After the cervix has been dilated, when this is necessary, the mucous membrane over the tumour is incised with a bistoury. The tumour is then shelled out of its bed—different scoop-like curettes have been devised for this by A. R. Simpson, Thomas and Pozzi. After the tumour has been removed, the cavity is douched with an antiseptic, and packed with idoform gauze. The risk of sepsis is great, from the sloughing tissue and the abundant lymphatic supply of the uterus. The mortality, according to Kleinwächter, is 15 p. c.[2]

Colpotomy for Fibroids.

3. *Colpotomy*, in which the tumour is got at by an incision in the fornix, is of very limited application to fibroids. It will be described in the Appendix.

Vaginal Hysterectomy.

4. *Vaginal Hysterectomy*, or removal of the whole uterus per vaginam has, during recent years, received a recognised place in the treatment of bleeding fibroids. While the first operation was done by Kortmann[3] in 1881, to Péan belongs the honour of having established the operation by skilful technique and phenomenal success.[4] At first sight it appears that only very small tumours can be thus treated, but by "morcellement" fibroid uteri up to the umbilicus may be removed.[5]

For tumours of considerable size, however, the abdominal or combined will always compete successfully with the vaginal method; and for small tumours, a more conservative surgery has prevailed in this country.[1] Extirpation of the uterus for small fibroids, does not rank with its extirpation for malignant disease. Cases in which the treatment is justifiable, occasionally present themselves, but they are the exception. We shall therefore defer the consideration of vaginal hysterectomy to the operative treatment of cancer, where it has an unquestioned place.

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[1] To consider these complications is beyond the scope of a Students' Manual, but they will be found admirably discussed in Kelly's Operative Gynecology, Vol. ii., p. 388 to 402.

[2] Twenty-two out of 147 cases collected: Wien. Med. Presse, 1886, No. 42. On the other hand, Leopold records 28 operations without a death: Archiv f. Gyn., 1890, Bd. xxxviii., Hft. 1. And Ascher 10 with one death: Zeits. f. Geb. u. Gyn., 1890, Bd. xx., Hft. 2, S. 307.

[3] Corresp. Schweiz. Arzte., Jan. 1882, No. 2, p. 42.

[4] In his most recent report, from 1890 to 1895, he has done 248 vaginal hysterectomies with four deaths, a mortality of 1·6 p. c.

[5] A favourite operation in France. Ségond recorded 66 cases of tumours reaching the umbilicu thus removed, with only seven deaths: Sem. Méd., 1895, p. 475; and more recently Dartigue mentions 25 cases with no deaths: Rev. de Gyn. et de Chir. Abd., 1901.

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[1] The first case recorded was done by Heywood Smith, to relieve pain which interfered with patient's work: Brit. Gyn. Jour., 1893-94, p. 440.

CHAPTER XXXVIII.

FIBRO-CYSTIC TUMOUR OF THE UTERUS.

LITERATURE.

Atlee—Ovarian Tumours: Philadelphia, 1873. *Beates*—Cystic Leiomyoma of Uterus: Am. Journ. of Obstet., 1884, p. 753. *Breus*—Ueber wahre epithelführende Cystenbildung in Uterusmyomen: Wien, 1893. *De Sinéty*—Manuel de Gynécologie, Paris, 1879, p. 413. *Diesterweg*—Ein Fall von Cysto-fibroma verum: Zts. f. Geb. und Gyn. ix., S. 191. *Gebhard*—Anatomie und Histologie der Myome: Veit's Handbuch d. Gyn. Bergmann, Wiesbaden, 1897. *Grasskopff*—Zur Kentniss der Cystomyome des Uterus: Munich, 1884. *Gusserow*—Neubildungen, etc.: Stuttgart, 1885, S. 117. *Haultain*—Benign Tumours of the Uterus: Allbutt and Playfair's System of Gynecology, London, 1896. *Heer*—Ueber Fibrocysten des Uterus: Zurich, 1874. *Leopold* and *Fehling*—Ein Beitrag zur Lehre von den kystischen Myomen des Uterus (Myosarcoma lymphangiektodes uteri): Archiv für Gyn., Bd. vii., S. 531. *Peaslee*—Ovarian Tumours: London, 1873. *Rein*—Beitrag zur Lehre von den lymphangiectatischen Fibromyomen des Uterus in pathologisch-anatomischer und klinischer Beziehung: Archiv f. Gyn., ix., S. 414. *Schroeder*—Die Krankheiten der weiblichen Geschlechtsorgane, S. 213: Leipzig, 1878. *Sir Spencer Wells*—Ovarian and Uterine Tumours: London, 1883. *Spiegelberg*—Die Diagnose der cystischen Myome des Uterus und ihre intraperitoneale Ausschälung, eine neue Operationsmethode derselben: Archiv f. Gyn., vi., S. 341.

SYNONYM—Cysto-fibroma.

It is open to question whether this form of tumour, which is extremely rare, merits consideration in a separate chapter. The majority of the so-called fibro-cystic tumours are uterine fibroids which have undergone myxomatous degeneration. As the result of this the physical signs of the tumour undergo such important modifications, that this variety of fibroid calls for special consideration from a clinical standpoint.

PATHOLOGY.

The majority of fibro-cystic tumours are simply fibroid tumours which have become softened. The spaces between the bundles of fibrous tissue open out and contain a homogeneous or only slightly striated or reticulated myxomatous intercellular substance; the trabeculæ between adjoining spaces give way, which allows these to run together to form larger cavities. Fig 231 shows this in a *subserous fibroid*, the form which most frequently undergoes this change.

The term "cystic," is, it is evident, misleading as applied to this form of tumour. The cavities are not "cysts," that is, they do not possess a special wall.

Lymphatic Origin.

Kœberlé was the first to suggest that some forms of fibro-cystic tumour might be due to *dilated lymphatics.* Leopold and Fehling have carefully described a case in which the cavities were lined with endothelium. The fluid from these cavities was of a clear yellow colour, and *coagulated* as soon as it was exposed to the air; fibrin was present in it. To this form the name of *Fibromyoma lymphangiektodes*

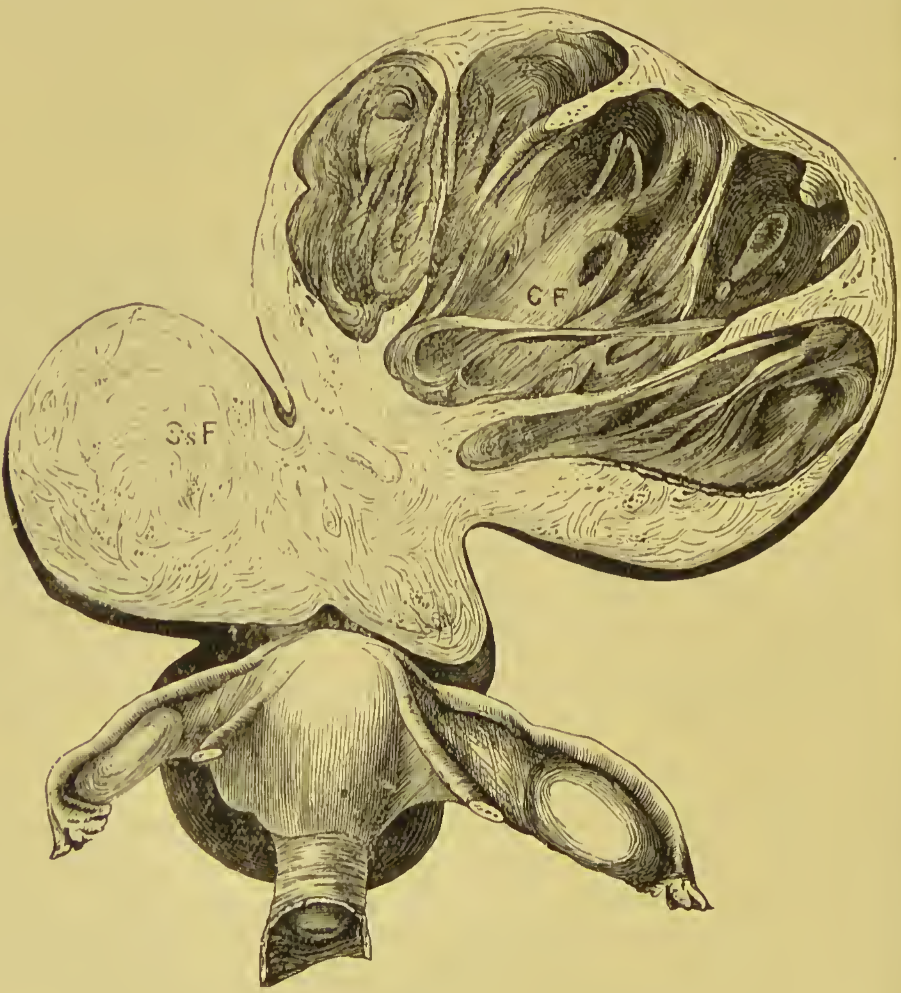

Fig. 231.

Large Three-lobed Fibroid springing from the fundus by a somewhat thin pedicle, of which CF is cystic, while SsF and the dark shaded mass behind the uterus are subserous. This along with two smaller fibroids growing from the posterior surface of the uterus was removed by laparotomy (*Schroeder*).

has been given. Müller[1] has also described a preparation in which he found the endothelial lining present in the smaller cysts. Atlee says this coagulation of the fluid—formation of colourless blood-clot—is diagnostic of the fluid from *all* fibro-cystic tumours, and may be relied on to distinguish them from ovarian. Spiegelberg records a case in which this spontaneous coagulation of the fluid was observed, but the most careful microscopic examination could detect no endothelial lining of the cavities. A transition case has been described by Rein, in which the cavities were not themselves lined with endothelium but *communicated* directly with the lymphatic spaces.

Mucoid Degeneration.

Mucoid degeneration of a fibroid tumour has been described by Virchow as Myxomyoma. In this case the interstitial tissue contained fluid rich in mucin and with numerous nucleated round cells.

Sarcomatous degeneration of a fibroid[2] apparently also produces a cystic condition of a fibroid tumour although this is not a true fibro-cystic tumour.

Cysts with an epithelial lining have also been described, which probably are cases of fibro-adenoma (*v.* p. 425).

SYMPTOMS.

These are the same as those of fibroid tumours, with the exception of a more rapid growth. As they are usually subserous, menorrhagia is not often present.

DIAGNOSIS: DIFFERENTIAL DIAGNOSIS.

Their diagnosis is often difficult, as the difference in consistence between the more solid and the fluid parts may escape detection. The connection of the tumour with the uterus is the most important point to establish. Examination under chloroform, with the drawing down of the uterus with the volsella and exploration per rectum is of service.

Differential Diagnosis.—Their diagnosis *from ovarian tumours* is the most important and, at the same time, the most difficult. As in the majority of cases they are merely altered fibroid tumours, their differentiation *from a simple fibroid* is merely a matter of degree of softness. In a case described by Beates as one of Cystic Leio-myoma of the uterus, the patient had been tapped twice;[3] and, as the fluid gave the ovarian cell described by Drysdale (*v.* p. 240), the case was set down as undoubtedly one of ovarian tumour. The differential diagnosis from ovarian tumour is often not made till the abdomen is opened.[1]

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[1] Beitrag zur Kenntniss der cystoiden Uterustumoren: Archiv f. Gyn., Bd. xxx., S. 249.

[2] As in Fenger's case (Amer. Jour. Obstet., 1888, p. 1200), and probably also Erich's (*ibid.*, 1886, p. 517). Aslanian records a case of fibro-sarcoma with a dilated condition of the veins—Archiv de Toc., Feb. 1895.

[3] In Hosack Fraser's case, the patient was tapped twenty-one times—Brit. Med. Jour., 1896, p. 837.

TREATMENT.

The treatment consists in removal by abdominal section, according to the methods described for fibroid tumours[2] (*v* p. 445).

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[1] As in a case by Lewers: London Obstet. Trans., 1895, p. 270. Also by Mayo Robson: Brit. Gyn. Jour., 1891-92, p. 137.

[2] Sometimes enucleation is required as in Alban Doran's case—Brit. Med. Jour., 1893, p. 1006. The same patient has been operated on more than once for this condition—Lancet, 1888, i., p. 973.

CHAPTER XXXIX.

UTERINE POLYPI: TUBERCULOSIS.

LITERATURE.

Barnes—Diseases of Women, p. 195: London, 1878. *De Sinéty*—Manuel pratique de Gynécologie, p. 419: Paris, 1879. *Gusserow*—Die Neubildungen des Uterus, Billroth's Handbuch, S. 179: Stuttgart, 1885. *Hegar und Kaltenbach*—Die operative Gynäkologie, S. 473: Stuttgart, 1881. *Hicks, Braxton*—Three cases of very large polypi of the uterus, etc.: Obstet. Journ. of Great Brit., Jan. 1879. *Küstner*—Notiz zur Metamorphose des Uterusepithels: Centralblatt f. Gyn., 1884, p. 321. *Matthews Duncan*—Edin. Med. Journ., July 1871; and Obstet. Journ., 1873, p. 497. *Simpson, Sir J. Y.*—Diseases of Women, p. 704: Edin., 1872. *Thomas*—Diseases of Women: London, 1880, p. 558. *Underhill*—On the Structure of three cervical Polypi, and the Structure of a true mucous Polypus of the Cervix: Edin. Obst. Soc. Trans., Vol. iv., pp. 231 and 241.

By the term "Polypus" is understood a pedunculated tumour attached to the mucous membrane of the uterus. It includes the following tumours, which are anatomically distinct:—

1. Submucous fibroids, which have become pedunculated and are in process of extrusion;
2. Mucous polypi and adenoma;
3. Pedunculated cystic follicles;
4. Placental polypi;
5. Papilloma of the cervix.

For clinical reasons, it is convenient to use the term polypus in its general sense as implying an external form alone; the symptoms produced by these tumours resemble one another, and their exact nature is sometimes not made out till they are removed. Pathologically, the term should be limited to mucous polypi. It is confusing to speak of a fibroid tumour which has a broad base of attachment as a submucous fibroid, and of one which has a pedicle as a fibrous polypus. The polypoidal projections formed by pedunculated ovula Nabothii are only pedunculated retention cysts. Placental polypi, unless malignant, are not true new-formations.

Pedunculated Submucous Fibroids.

1. *Pedunculated submucous fibroid tumours* form the so-called "fibrous polypi." They spring from the *muscular* wall of the uterus, usually from the *body* which, as we have seen, is more commonly the seat of fibroid tumours than the cervix. They are of *firm* consistence, of a size varying from a goose's egg upwards, and are of a rounded or pyriform shape (fig. 232), sometimes elongated and constricted through the pressure of the uterine walls (fig. 219); the surface is smooth or marked with furrows corresponding to the fasciculi of fibrous tissue.

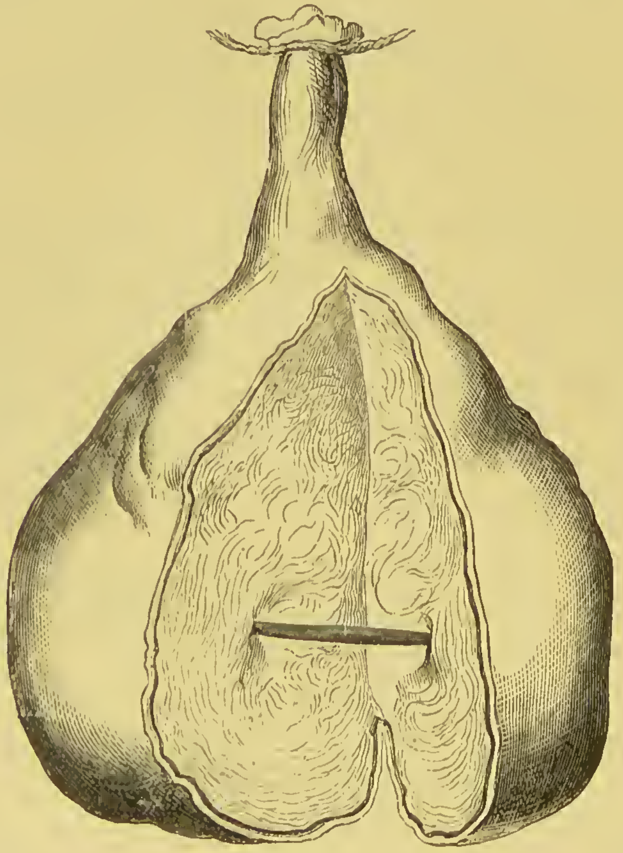

FIG. 232.

FIBROUS POLYPUS LAID OPEN TO SHOW ITS IDENTITY IN STRUCTURE WITH A FIBROID TUMOUR (*Sir J. Y. Simpson*).

Sometimes they are of such a size[1] that, although lying in the vagina, they fill the pelvis and press on the bladder and rectum; the uterus is then raised above the pelvic brim (just as it is elevated when the vagina is distended with fluid), and is felt as a smaller body riding on the top of the tumour. Adhesions may form between the surface of the fibroid and the vagina, producing the impression that the tumour springs from the vaginal mucous membrane.[2]

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[1] Kœberlé removed one weighing over 1½ lbs.: Centralb. f. Gyn., 1889, S. 263.

[2] Braxton Hicks—*Loc. cit.*

The pedicle consists of a narrowing of the calibre of the tumour towards its base of attachment, or of a distinct stalk which may be long enough to allow the fibroid to lie at the vulva. As fibroid tumours are sparingly vascular, the pedicle does not, as a rule, contain large vessels. When a pedunculated submucous fibroid lies in the cavity of the uterus, it sets up uterine contractions which lead to its expulsion; there is a stage at which it lies partly within the uterus (fig. 233), partly in the vagina (the portion constricted by the cervix has been mistaken for a pedicle, and only the lower lobe of the hour-glass tumour removed); finally, the whole tumour lies in the vagina, but still maintains its connection with the uterus through its pedicle (fig. 234). The congestion of the fibroid excites uterine contractions, specially at the menstrual

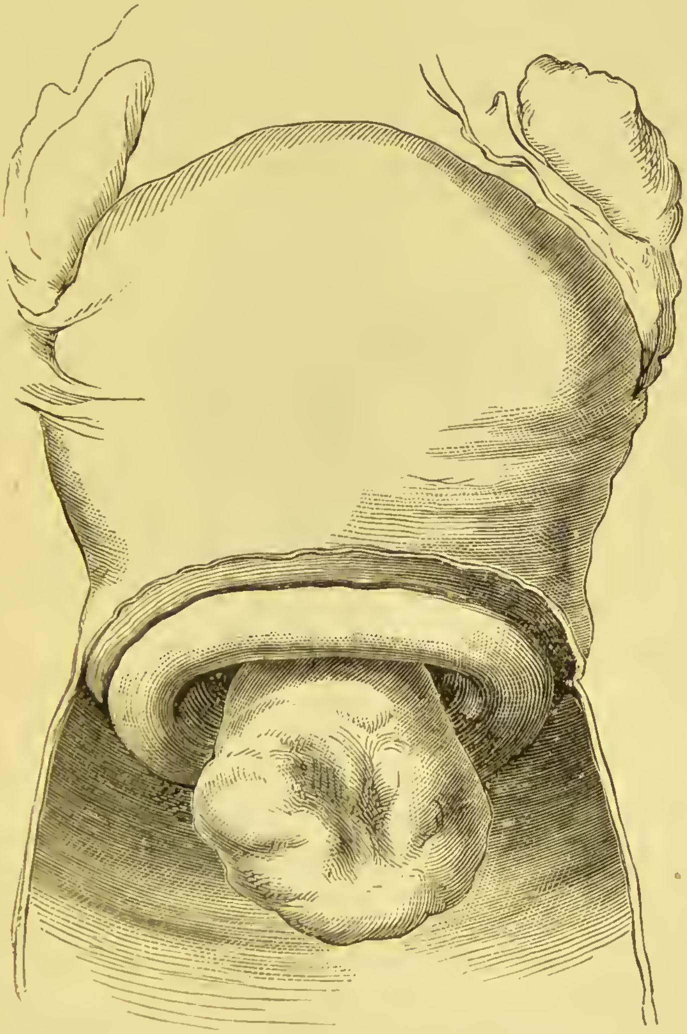

FIG. 233.

INTRA-UTERINE SUBMUCOUS FIBROID WHICH IS BECOMING VAGINAL (*Sir J. Y. Simpson*).

period, and thus favours its expulsion. At those times, we may have the cervical canal only temporarily dilated and the polypus projecting through it; after the period, the contractions pass off and the polypus is retracted into the uterine cavity. This condition is fully described by French writers under the name of "polypes à apparitions intermittentes." Its practical importance is that we should examine sometimes at the menstrual period, when a polypus (not recognisable at other times) may be felt through a dilated cervix.

They have the microscopic structure described at p. 413 (*v.* fig. 232).

Mucous Polypi.

2. *Mucous polypi* are developed from the *mucous membrane* of the uterus, most frequently from that of *the cervix*. They are of *soft* pulpy consistence, of about the size of an almond—rarely larger—and have a flattened form; usually, there are more than one present (fig. 235). They are extremely vascular and have the microscopic structure of the mucous membrane from which they are developed.

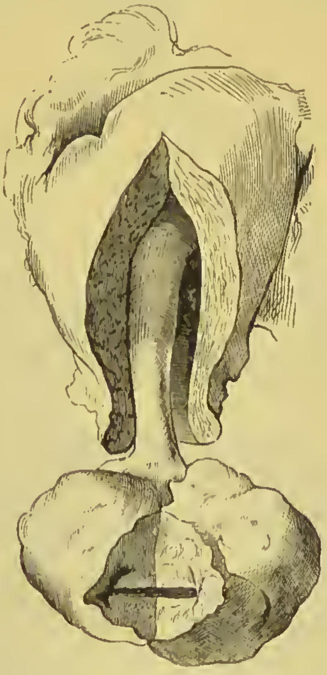

FIG. 234.

SUBMUCOUS FIBROID WHICH HAS COME TO LIE WHOLLY IN THE VAGINA (*Sir J. Y. Simpson*).

The typical cervical polypus has the structure seen at fig. 236. From the fact that the gland-ducts appear as channels on the surface, it was described by Oldham as the "channeled polypus." Sometimes the polypus shows also the stratified epithelium of the vaginal aspect of the cervix, as in a specimen described by Underhill; he supposes that in this case it sprang from the margin of the os externum; he describes also a polypus which sprang from the *vaginal aspect* and showed only the stratified epithelium. Küstner has shown that stratified epithelium may be found on mucous polypi which have grown high up in the cervical canal. These polypi sometimes form the starting-point of malignant disease. Underhill traced the commencement of sarcomatous degeneration in one case.

De Sinéty divides them into two groups according as they spring (1) from the cervix, (2) from the body of the uterus. Each has the characteristic epithelium (*v.* p. 21) lining the ducts and cysts; the former have the columnar non-ciliated epithelium of the cervix, the latter the ciliated cylindrical epithelium of the body.

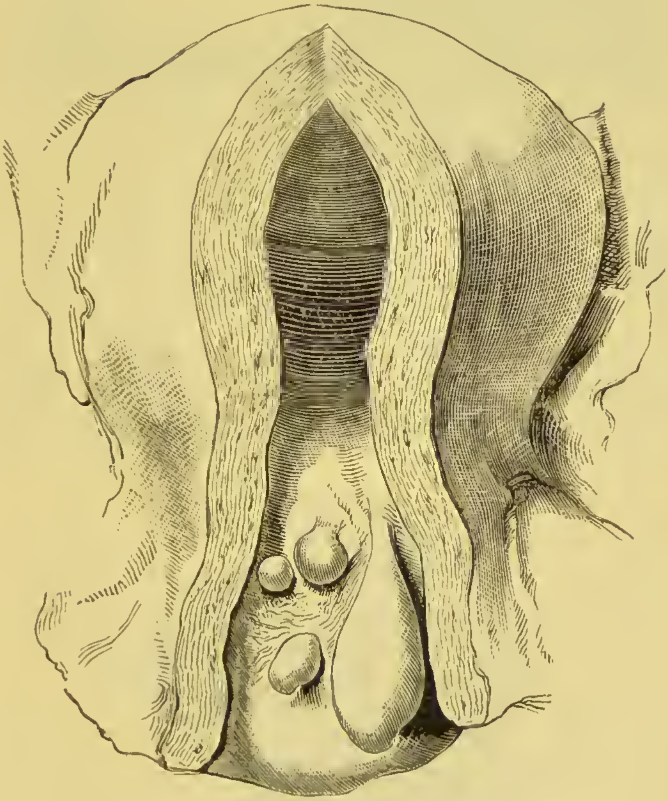

FIG. 235.

GROUP OF MUCOUS POLYPI GROWING IN THE CERVIX UTERI (*Sir J. Y. Simpson*).

A localised hypertrophy of the glands of the uterus has been described by Schroeder as adenoma polyposum; the changes resemble those of glandular endometritis (*v.* p. 332).

Williams, in his monograph,[1] describes four cases of adenoma of the cervix, two being simple villous growths and two being malignant.

3. *Pedunculated Nabothian follicles* have been already described under cervical catarrh (p. 324).

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[1] Cancer of the Uterus: London 1888, pp. 40-44.

Placental Polypi.

4. *Placental or fibrinous polypi.* These are produced as the result of incomplete detachment of the placenta; in some cases we can trace placental villi in their structure. On the surface of this irregularity of the mucous membrane, blood coagulates; and thus the fragment of placenta grows larger through being coated with fibrin. This increase in size may go on until the polypus is the size of an egg. This form of polypus is not a new-formation and only finds a place here on account of its polypoidal form. After an abortion,[1] they may form in the same way, a piece of decidua left in the uterus maintaining its structure, vitality and nutritive connection with the tissues below.

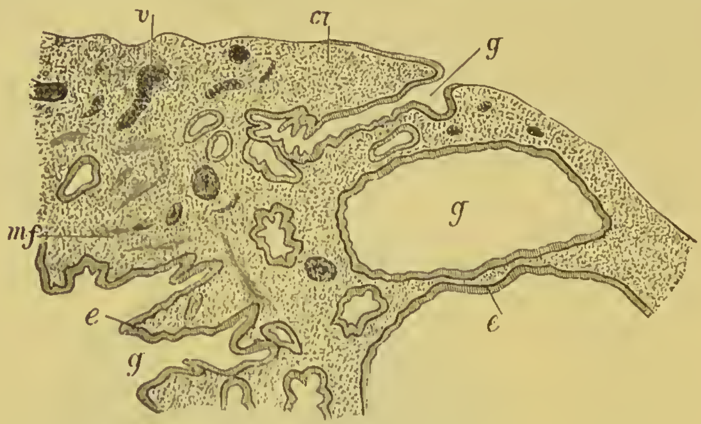

FIG. 236.

SECTION OF A MUCOUS POLYPUS OF THE CERVIX $\frac{40}{1}$. *g* dilated glands, *e* epithelium, *mf* muscular fibre, *v* blood-vessel, *ct* connective tissue (*De Sinéty*).

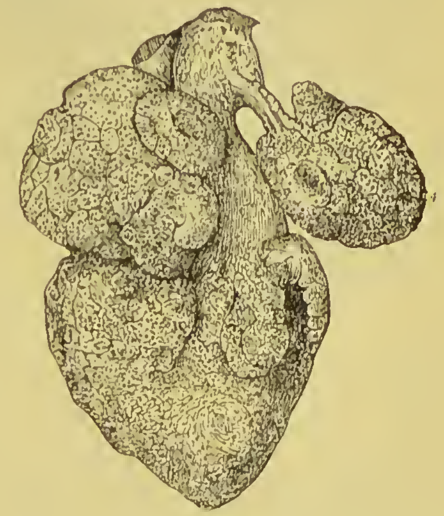

FIG. 237.

NON-MALIGNANT PAPILLOMA OR FIBROMA PAPILLARE OF CERVIX (*Ackermann*).

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[1] Küstner—Beiträge zur Lehre von der Endometritis: Jena, 1883.

Attention has recently been directed to "destructive polypi" of the placental site, especially in connection with deciduoma malignum and its relation to hydatid mole. Fraenkel[1] has studied the changes in hydatid moles, and finds colonies of cells, lying at some distance from the villi, apparently due to a proliferation of syncytium and the layer of cells beneath. These form the stepping-stone to the malignant tumours arising at the placental site (*see* Deciduoma Malignum—Chap. XLIII.).

5. *Papilloma of the cervix.* Simple papilloma of the cervix is a very rare form of tumour; the great proportion of papillary tumours found here are malignant (carcinomatous or sarcomatous). Fig. 237 shows such a tumour, described by Ackermann,[2] which sprang from the anterior lip of the cervix. It consisted of a branching stem of connective tissue, with papillæ covered mostly with squamous but in some places with a single layer of cylindrical epithelium. There was no recurrence after removal. The term "cauliflower" excrescence, introduced by Clarke, describes very well the appearance of these tumours. Virchow has shown that in many of these papillomata we find proliferation of the epithelium, and that they form the first stage of epithelial cancer of the cervix (*v.* p. 474); we must therefore regard the cauliflower excrescence as, in the great proportion of cases, a malignant tumour.

SYMPTOMS.

These are Hæmorrhage,
Leucorrhœa,
Dysmenorrhœal pains,
Sterility,
Irritation and discomfort.

Hæmorrhage.

The *hæmorrhage* shows itself first as an increase of the ordinary menstrual flow; afterwards, it comes at irregular intervals. In the case of a submucous fibroid, it comes from the uterine mucous membrane which is hypertrophied. In the mucous polypus it comes from the tumour itself which is vascular and bleeds easily; when the polypus protrudes through the cervix, there may be hæmorrhage[3] (*v.* the preparation represented at fig. 82). In other cases the drain of blood, though not directly fatal, may produce profound anæmia; hence the importance of ascertaining and removing the cause of the hæmorrhage. The cachectic appearance of the patient, thus induced, may be such as to lead us to form a strong prepossession in favour of the existence of malignant disease before we proceed to physical examination.

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[1] Die Histologie der Blasenmolen und ihre Beziehungen zu den malignen von den Chorionzotten (Decidua) ausgehenden Uterustumoren: Archiv f. Gyn., xlix. (1895) S. 480.

[2] Virchow's Archiv: Bd. xliii., S. 88.

[3] Barnes records the case of a woman of twenty-six years of age in which a polypus the size of a walnut produced a fatal hæmorrhage.

Leucorrhœa.

The *leucorrhœa* is due to the endometritis which is always present. The polypoidal retention-cysts are the result of a chronic catarrh of the cervix or uterus. It is disputed whether mucous polypi are the cause or the result of the inflammatory changes; De Sinéty inclines to the latter view. When the polypus comes to lie in the vagina, it produces an irritating vaginal leucorrhœa.

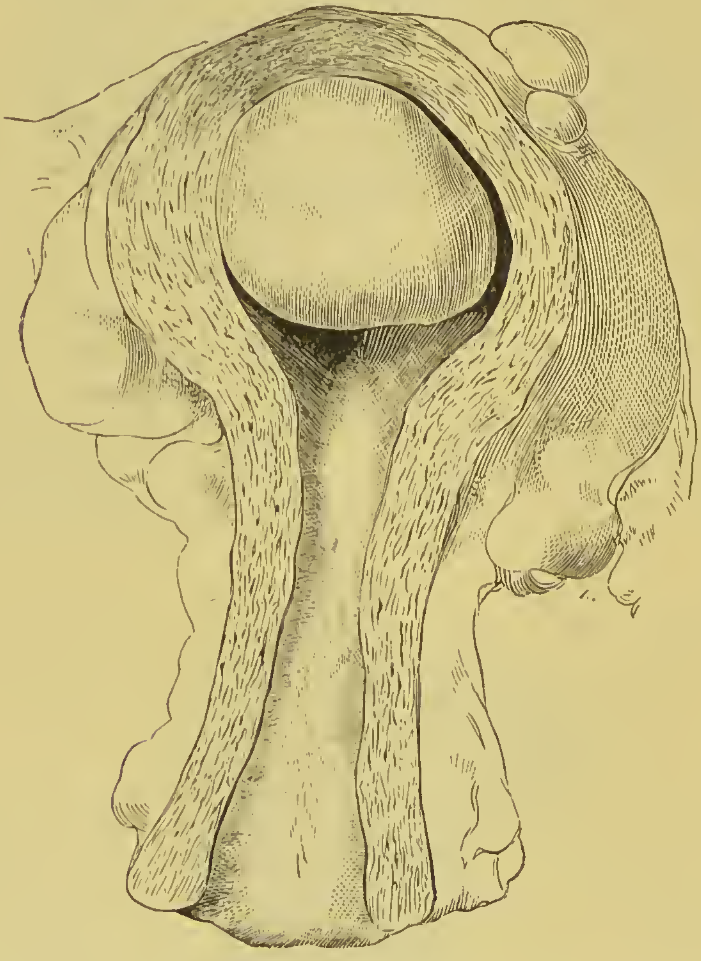

Fig. 238.

Pedunculated Submucous Fibroid, springing from the fundus, which has not dilated the cervical canal (*Sir J. Y. Simpson*).

Dysmenorrhœal Pains.

The *dysmenorrhœal pains* are due to the muscular efforts of the uterus to expel the polypus, and are most marked when the polypus has descended to the os internum or lies in the cervical canal.

In rare cases the presence of the foreign body in the uterus has produced the sympathetic phenomena of pregnancy—pigmentation of the breasts and abdomen, and morning sickness.

Sterility.

Sterility is occasioned by the mechanical obstruction of the polypus, or more frequently by the associated endometritis.

A pedunculated fibroid may form a serious complication to labour, in preventing the progress of the child's head; such a polypus has been laid hold of with the forceps under the impression that it was the presenting head. They may also give rise to hæmorrhage in the puerperium.[1]

DIAGNOSIS.

1. *When the polypus has dilated the os externum*, it will be recognised by the finger per vaginam. If it be larger than a walnut and of firm consistence, and if the uterine cavity be increased in length, it is a pedunculated fibroid tumour. If it be small and of a pulpy consistence, it is a true mucous polypus; mucous polypi do not, as a rule, produce hypertrophy of the uterus.

Having learned that there is a pedunculated body in the vagina or cervical canal, carry the finger upwards to ascertain its point of attachment; if this be high up in the uterine cavity, the tumour is a pedunculated fibroid; if it springs from the cervical mucous membrane, it is probably a mucous polypus.

On bimanual examination, the uterus is found to be enlarged in the case of pedunculated fibroids; it is not enlarged with mucous polypi, unless from associated chronic metritis.

The speculum shows that the surface of the true mucous polypus has a bright cherry-red colour, which contrasts with the darker red of the cervical mucous membrane embracing it. The appearance of the fibroid tumour depends on the condition of the investing mucous membrane, which is often ulcerated or sloughing; when the capsule has given way, the fibrous substance of the tumour is seen to be of a paler colour.

2. *When the uterus is enlarged but the os externum not dilated*, the diagnosis is more difficult (fig. 238). If the uterus be markedly enlarged and of firm consistence and (the possibility of pregnancy being excluded), the sound pass for 4 or 5 inches, there is probably a submucous fibroid tumour. It is difficult to determine whether it is pedunculated or not. The sound must be used with care as its use is not unattended with risk; laceration of the mucous membrane, with the introduction of septic matter, has resulted from too free and repeated exploration in this way. Dilatation of the cervix and exploration with the finger are sometimes necessary to ascertain whether the fibroid be pedunculated, and to what part of the uterus it is attached.

3. *When the uterus is not much enlarged*, the diagnosis is very difficult. The possibility of a fibroid tumour is excluded. A small mucous polypus, however, may exist in the uterine cavity and escape detection with the sound. In such a case, it is recognised only on dilating the cervix and exploring the uterine cavity with the finger.

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[1] *See* paper by Halliday Croom on Fibrous Polypi complicating the puerperium: Edin. Med. Jour., xxii., i., p. 289.

The *curette* is a valuable aid to diagnose when the actual exploration of the uterine cavity with the finger is not desirable. By its use we diagnose and treat the case at the same time. Thus irregularity of the uterine surface (which is easily detected by the curette), and the character of the scrapings removed, may show that we have to do with pedunculated retention-cysts or placental polypi.

DIFFERENTIAL DIAGNOSIS.

The characters which distinguish a pedunculated fibroid from a mucous polypus are its larger size, firmer consistence, and its springing from the body of the uterus. The uterine cavity is increased in size. We probably find, also, other fibroid tumours, interstitial or subserous.

A pedunculated fibroid hanging down into the vagina, may readily be mistaken for the inverted fundus uteri; this is most likely to happen when there is much hæmorrhage from the former, and when concomitant pelvic inflammation makes examination difficult. A true diagnosis here is all-important, as removal of the fibroid may save the patient's life; while amputation of the uterus, under the supposition that it was a fibroid, may lead to disastrous consequences.

Given a tumour the size of a pear hanging down through the cervical canal into the vagina, we wish to make sure that it is not the inverted body. First, sweep the finger carefully round the neck and note whether the mucous membrane of the cervical canal is reflected on to the neck of the tumour; sometimes inflammatory adhesions round the neck produce a condition simulating inversion. Now make the bimanual; if the body in the vagina be a fibroid, the uterus will be in its normal place. The abdomino-vaginal examination is often difficult on account of the body in the vagina; therefore pass the finger into the rectum, through the anterior wall of which we can distinctly feel whether the cervix has a truncated end above (inversion), or passes up into the body of the uterus (fibroid); the abdomino-rectal examination makes this more evident. When examination is difficult and the diagnosis doubtful, we should not hesitate to give chloroform and make a thorough examination; it is well to be prepared to operate at the same time, if necessary.

Finally, use the sound, which is an important test. Sweep the finger carefully round the neck of the tumour and feel for a depression corresponding to the os, into which endeavour to introduce the sound. If it passes for two and a half inches or more and is then arrested, it is probably in the uterine cavity; make sure of this by pressure with the hand on the abdominal wall, or per rectum.

When the tumour in the vagina fills the pelvis or rides above the brim, so that the finger cannot reach the pedicle or feel whether the os is present, the diagnosis is very difficult. We rely on careful abdominal palpation to ascertain whether the uterus can be felt resting on the top of the tumour.

We must not forget that we may have both conditions present, *i.e.*, pedunculated fibroid + a certain amount of inversion.

PROGNOSIS.

The prognosis as to *danger to life* will depend on the hæmorrhage. Wherever a polypus is present, we should advise its removal.

As to *the operation*, the removal of mucous polypi and smaller fibroids is safe and easy. The fear of hæmorrhage from the pedicle of a fibroid tumour, which led to the treatment by ligature, has been found by experience to have been exaggerated. Where there is a rigid cervix to be dilated before we can remove the tumour, where the tumour is large so that it must be removed in portions, where there is a thick pedicle and consequently a larger raw surface, the operation will be a more serious one and the prognosis given more guardedly.

Should there be pregnancy, the polypus may be removed without interrupting its course. If it be of such a size as to interfere with labour, it should be removed as soon as discovered.

TREATMENT.

Whenever it is necessary to dilate the cervix for diagnosis, we should have instruments ready to remove the tumour at the same time. The dilatation is effected by laminaria tents, or by graduated dilators. A good method is to place a laminaria tent in the cervix to start the dilatation; after six or eight hours chloroform the patient, fix the cervix with volsellæ, and introduce the graduated dilators in succession till the cervical canal is wide enough to admit the index finger; remove the polypus by the means to be described; and wash out the uterine cavity with an antiseptic solution.

Small *polypoidal projections* are removed with the curette, as described under Endometritis, followed by the application of pure carbolic acid.

Mucous polypi are twisted off with the forceps, shown at fig. 239. It is advantageous to use forceps with a catch, as this keeps a steady hold of the tumour and leaves the operator's fingers free to twist the forceps round.

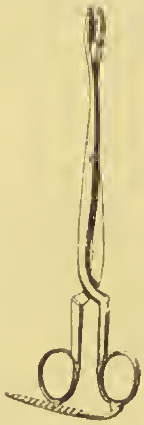

FIG. 239.

FORCEPS WITH CATCH FOR REMOVING MUCOUS POLYPI.

In removing *fibroids*, we first ascertain the seat of insertion and size of the pedicle. When the tumour is small, we can learn this by the fingers; when so large that we cannot get the fingers past the tumour to the pedicle, we probe round its base with the sound or, laying hold of the tumour with forceps, endeavour to rotate it and thus test the thickness of the pedicle.

The pedicle will yield to torsion with the forceps. This is the simplest method and should always be tried in the first instance. If this fail, divide the pedicle with curved scissors. Make traction with the forceps to render the pedicle tense; too forcible traction might produce inversion. Guarding the uterine wall with the fingers, carry in the curved scissors. In cutting, make the scissors hug the surface of the tumour and thus keep clear of the uterine wall. Strangulation by ligature, formerly widely practised, is now entirely abandoned; the sloughing stump was a fruitful source of sepsis.

When the pedicle is of considerable thickness, it may be divided with the écraseur or with the galvano-caustic wire. The wire écraseur is preferable to the chain écraseur, as it is more easily applied. For the nature and method of use of the écraseur, the student is referred to Treatment of Carcinoma of the Cervix.

When the size of the tumour makes the pedicle inaccessible, it must be diminished. This is best effected by Hegar's method: traction is made on the tumour, which is at the same time incised in a spiral manner with scissors; the tumour is thus (as it were) unwound, till finally the pedicle is reached and divided.

Chloroform is not necessary for the removal of the smaller polypi. The section of the pedicle is painless; if pain be present on tightening the écraseur round the neck of a polypus, the operator should examine carefully again to make sure that the wire is not constricting the inverted fundus. Where the polypus is large and the operation tedious, it is better to have the patient anæsthetised as the operator has then more freedom.

TUBERCULOSIS UTERI.

LITERATURE. *Beyca*—Tuberculosis of the Portio-vaginalis and Cervix Uteri: Am. Jour. Med. Sc., November 1901. *Hegar*—Die Entstehung, Diagnose, und chirurgische Behandlung der Genitaltuberculose des Weibes: Stuttgart, 1886. *Cornil*—Sur la Tuberculose des Organes génitaux de la femme: Verneuil, 1888. *Glockner*—Zur papillären Tuberculose der Cervix, etc.: Beit. z. Geb. u. Gyn., Band. V., Berlin, 1901. *Lewers*—A Case of Primary Tuberculosis of the Cervix, etc.: Lond. Obst., Trans., 1902, p. 144. *Pozzi*—Traité de Gynécologie: Paris, 1897, p. 904. *J. D. Williams*—Tuberculous Disease of the Portio Vaginalis: Brit. Med. Jour., 1895, Vol. I., p. 969. The literature is given fully in Williams' paper.

WHILE tuberculosis of the genital tract, though a rare condition,[1] has given rise to considerable discussion as to its production by direct infection, and tuberculosis of the tubes is of special interest with regard to tuberculous peritonitis, tuberculosis of the uterus is not of great importance. It is usually secondary, that is to say, appearing in the course of development of tubercle in some other organ, and especially in the lungs.

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[1] Williams found it present in 3% of 100 *post-mortems* in the female pelvic organs, and cites its frequency in the operating theatre as being, according to Martin 3%, and Whitridge Williams 8% in the case of appendages removed for inflammatory disease.

It may affect the whole uterus, sometimes the cervix only. Of the seventy cases of tubercle of the cervix collected by Beyea from the literature, thirty were discovered *post-mortem* associated with tuberculosis of the rest of the genital tract; while fifteen cases had been noted clinically and found *post-mortem* to be associated with tuberculosis elsewhere. It occurs most frequently between 20 and 30, but may occur as late as 70.[1] It shows itself in the cervix in three forms: (1) *Papillary*, in which reddish papillæ are present, projecting from the os or projecting on to the vaginal aspect of the cervix, and sometimes forming a tumour the size of a small orange; (2) *Ulcerative*, in which large single, or small multiple ulcers are present on the vaginal aspect of the cervix or in the canal; they have well-defined edges and are covered with yellowish or grey matter; (3) *Miliary* tuberculosis, in which miliary tubercles are present on the vaginal aspect, associated with general tuberculosis. It is rarely primary,[2] but when this occurs the possibility of infection as the result of coitus[3] should be enquired into.

The *symptoms* are profuse purulent leucorrhœa with hæmorrhage. While it runs a much slower course than cancer it has sometimes been mistaken for it, diagnosis only being made on extirpation of the uterus.[4]

The *treatment* consists in excision[5] of the affected area, amputation of the cervix, or vaginal hysterectomy, according to the situation and extent of the affection. The radical operation should only be done if the disease is localised to the uterus; or, at least, not developed in other situations. The Fallopian tubes should always be removed with the uterus.

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[1] As in Horrocks' case (Lond. Obst. Trans., 1902, p. 141) which was diagnosed as malignant disease until hysterectomy was performed, and where there was no evidence of lung mischief.

[2] Beyea records two cases, and others have been reported by Lewers, Croft, and Brooks (Lond. Obst. Trans., 1903, p. 185).

[3] As in the case recorded by Glockner, where the husband had a tuberculous orchitis.

[4] As in Williamson's two cases of Tubercle of the Body of the Uterus (Lond. Obst. Trans., 1902, p. 141) and Horrocks' case (*ibid*). In Croft's case, in which the cervix was affected (*ibid*, p. 142) diagnosis was made from the scrapings before hysterectomy was performed.

[5] As was done in the first instance in Brooks' case, in which, however, the invasion of the other lip of the cervix a month later was an indication for hysterectomy.

CHAPTER XL.

CARCINOMA UTERI (OF CERVIX): PATHOLOGY AND ETIOLOGY.

LITERATURE.

Barbour—Cases of Carcinoma of the Female Pelvic Organs: Edin. Med. Jour., July 1880. *Cullen*—Cancer of the Uterus: Kimpton, London, 1900. *Gusserow*—Die Neubildungen des Uterus, S. 199: Stuttgart, 1885. Ueber Carcinoma Uteri, Volkmann's Samml. klin. Vor., N. 18. *Pozzi*—Traité de Gynécologie: Paris, 1897. *Ruge and Veit*—Zur Pathologie der Vaginal-portion: Stuttgart, 1878. Der Krebs der Gebärmutter: Stuttgart, 1881. *Russell*—The Operative Significance of Metastasis and Post-operative Recurrences in Carcinoma of the Uterus: Am. Jour. Obstet., Dec. 1896. *Schroeder*—Die Krankheiten der weiblichen Geschlechtsorgane, S. 264: Leipzig, 1878. *Seelig*—Path. Anat. Untersuch. über die Ausbreitung des Gebärmutterkrebs: inaug. dissert. Strasburg, 1894. *Simpson, Sir J. Y.*—Diseases of Women: Edinburgh, 1872, p. 140. *Sinclair, W. J.*—Malignant Diseases of the Uterus: Clifford Allbutt's System of Gynecology, London, 1896. *Tanner*—On Cancer of Female Sexual Organs: London, 1863. *Veit*—Sur Anat. des Carcinoma Uteri: Zeits. f. Geb. u. Gyn., Bd. xxxii. *Virchow*—Ueber Cancroide und Papillargeschwülste, 1850. *Williams, Sir John*—Cancer of the Uterus: London, 1888. *Williams, Roger*—The Morphology of Uterine Cancer: Brit. Gyn. Jour., 1895-96, p. 529. Uterine Tumours, their Pathology and Treatment: London, Baillière, Tindall and Cox, 1901. *Winter*—Über die Recidive des Uteruskrebses inbesondere über Impfrecidive. Über die Ursache der Krebsrecidive: Zeits. f. Geb. u. Gyn., 1892, S. 141. Anatomie des Carcinoma Uteri: Veit's Handbuch d. Gyn., Wiesbaden, Bergmann, 1899. A good bibliography will be found in Winter's last article.

Thus far we have considered only the simple or benign tumours in the uterus. We pass now to the malignant; and these present themselves under the two chief types, viz., epithelial and connective-tissue, as carcinoma and sarcoma. Two rarer forms of malignant disease have recently attracted attention—the adenoma malignum and deciduoma malignum. They will be considered with Carcinoma of the Body of the Uterus (Chap. XLIII.), as it is in the body that they are usually found.

The cervix, as we have seen, differs anatomically from the body of the uterus; it also differs pathologically, *i.e.*, is distinctly marked off from the body of the uterus as regards some of the morbid processes to which it is liable. We have seen that while the body of the uterus is the common seat of fibroid tumours, the cervix is rarely so; in cancer the opposite condition obtains, for the body is rarely, while the cervix is very often, attacked by it. When cancer of the uterus is spoken of, it is in fact almost always cancer of the cervix that is meant; and it is the latter that we have chiefly to consider here, for only about 2°/。 of the cases of cancer are in the body, the remaining 98°/。 being in the cervix.

PATHOLOGY.

The pathology of cancer of the uterus is a complex subject on which much has been written. In a retrospect of the literature the following landmarks stand out. First, the early contributions of Robin (1852), Cornil (1865), and Waldeyer (1867), which demonstrated its epithelial origin. In 1881 appeared the important monograph of Ruge and Veit, followed later by that of Sir John Williams. During the last fifteen years many papers have appeared, of which we may mention those by Seelig, Winter, and Roger Williams. The most recent work is that of Cullen, based on the study of 182 cases; the prominence given to microscopic details and the abundant illustration of these, are the features of this valuable book.

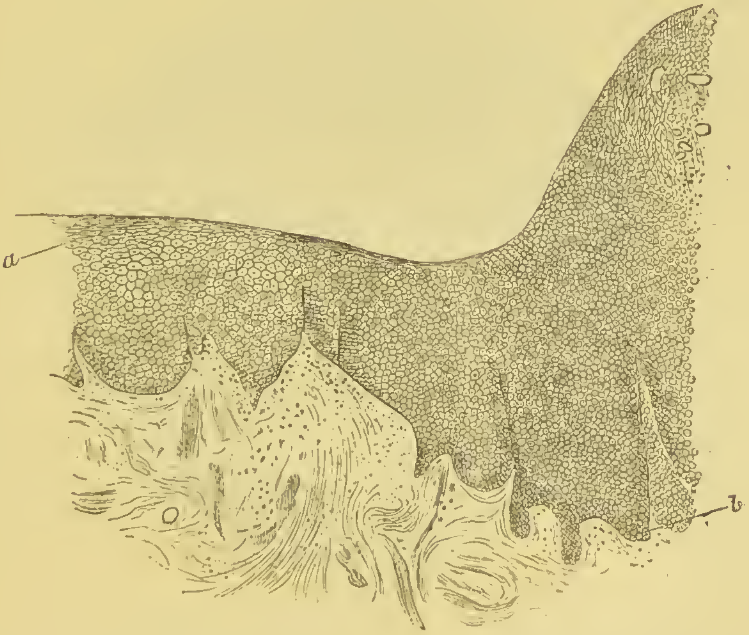

FIG. 240.

CANCER OF THE VAGINAL PORTION (*J. Williams*).

a, Normal squamous epithelium on the vaginal aspect of the cervix; *b*, processes of cancerous cells which have developed from it.

ORIGIN.

The vaginal aspect of the cervix is covered with squamous epithelium, arranged in many layers on subjacent papillæ of vascular connective tissue. It thus resembles anatomically the skin, without the glands and hair follicles. From it develops epithelioma (squamous-celled epithelioma of Cullen, epidermoidal cancer of Roger Williams) which differs from epithelioma of the skin in its more rapid development and the active growth of the connective tissue stroma (fig. 240).

Within the cervical canal are the racemose glands opening on the mucous membrane, which is covered with a low, columnar, ciliated epithelium. From this develops a glandular type of carcinoma—cylinder-celled cancer, adeno-carcinoma of Cullen (fig. 242).

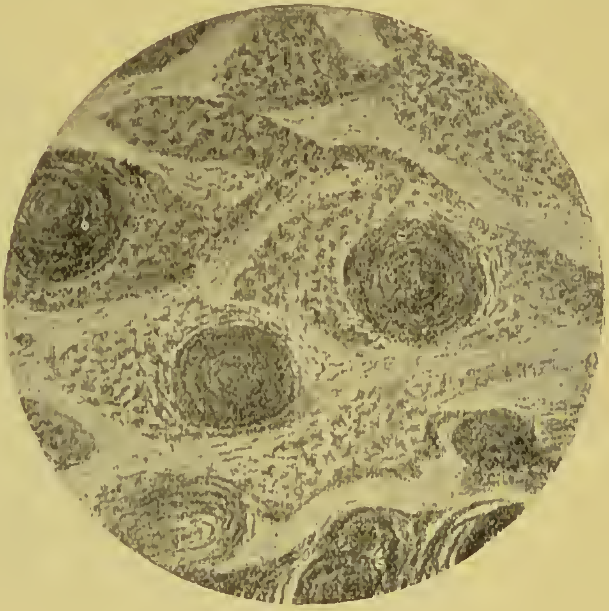

FIG. 241.

EPITHELIOMA OF THE CERVIX (*Gebhard*).

Note the epithelial ingrowths cut across, giving the appearance of nests, also the small-celled infiltration around these.

VARIETIES.

There are thus two types of cancer of the cervix, according to its point of origin on the external or internal aspect.[1] The line which separates these areas is however, not definite in multiparæ, in whom cancer usually develops. For, on the one hand, in multiparæ, who furnish the large proportion of cases of cancer, the epithelium, characteristic of the canal, extends beyond the limits of the os externum (*vide* p. 322), and on the other, the epithelium lining the canal seems in some cases to take on a stratified character in the initial stages of cancer (Winter), and a characteristically squamous-celled cancer has been found within the canal.[1] Nor do the cancer cells in their growth always preserve the type of cell from which they spring. So that while we may speak of a squamous-celled and a cylinder-celled cancer, according to its origin, the distinction cannot always be maintained in the advanced stages of the growth. Only thus can we account for the great discrepancy in the opinions of the authorities as to the relative frequency of these two types.

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[1] A third but extremely rare form developes from the endothelium of blood-vessels, lymphatics or peritoneum—*endothelioma*. It resembles adenoma malignum in that the cells are in one layer, only they are spindle-shaped (Cullen, p. 349).

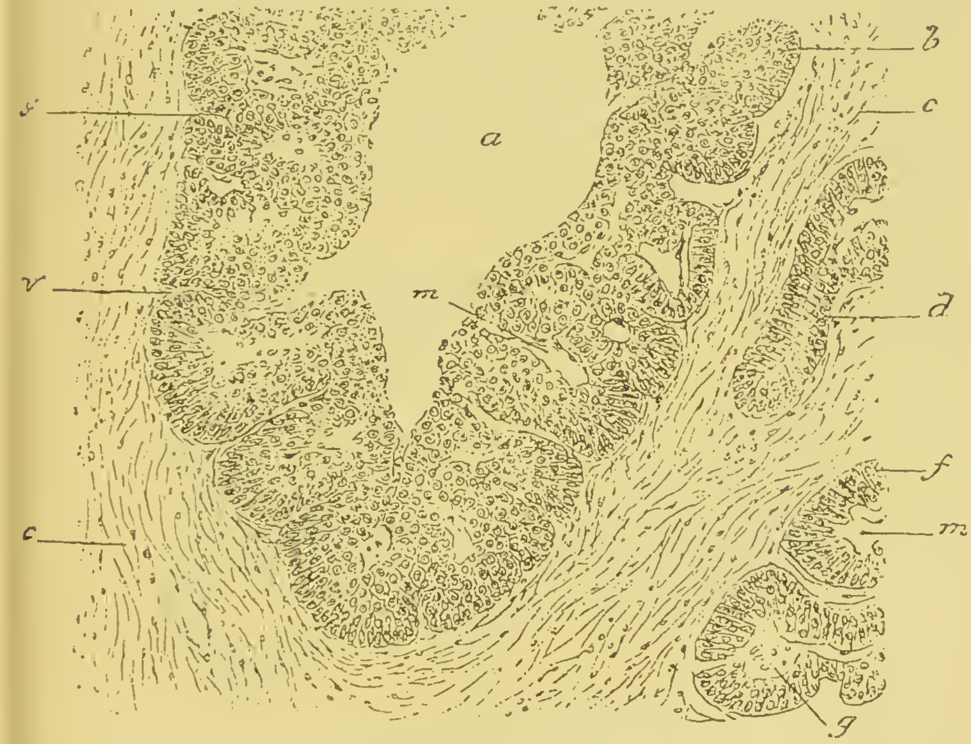

FIG. 242.

GLANDULAR CANCER OF THE UTERUS (*Cornil*).

Note the lumen (*a*) surrounded by cancer cells in many layers, the peripheral being cylindrical; (*b*) cancerous bud growing into the connective tissue of the stroma (*c*); (*d*) gland with process just commencing, which is more advanced in (*f*) and (*g*); (*v*) and (*j*) vascular processes of stroma entering epithelial buds.

Thus Sir John Williams in his monograph described seven cases of epithelioma and fifteen of glandular carcinoma, making the latter much the more frequent. In which view Roger Williams agrees. On the other hand Cullen, of 147 carefully described cases recorded in his book, makes 129 belong to the squamous-celled, and only 19 to the cylinder-celled form.

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[1] As in Cullingworth's case: Lond. Obstet. Trans., 1892, p. 136.

The leading characteristics of the two types are as follows:—

(1) *Epithelioma* is the same as we are familiar with in the skin. It originates in the deeper layer of the squamous cells covering the connective tissue papillæ of the normal vaginal mucosa (fig. 24). The superficial layers of the epithelium are sometimes thin, with the villi exposed. As the result of the proliferation the squamous epithelium is seen extending as plugs into the cellular tissue (fig. 240), which on cross section, from the concentric arrangement of the cells, appear as cell nests (fig. 241). The central cells of the plugs may be affected by fatty or hyaline degeneration, and fall out, thus producing a space which simulates glandular carcinoma. Coincident with the ingrowth there is often a branching outgrowth of the stroma and epithelium, forming a mushroom-like tumour or cauliflower excrescence. The connective tissue around the plug is infiltrated with small round cells, and very vascular.

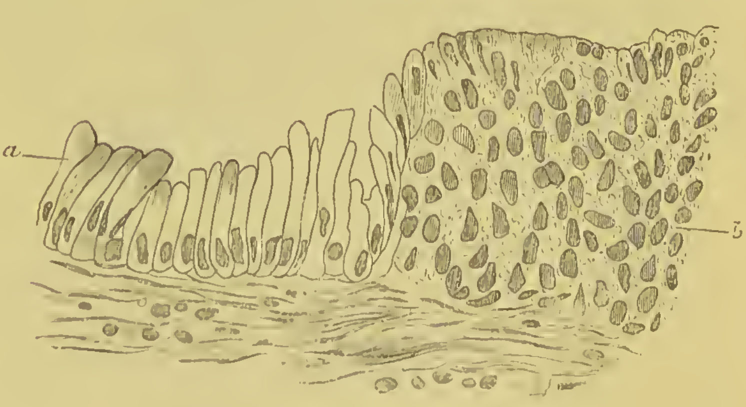

FIG. 243.

CANCER OF THE CERVIX PROPER (*J. Williams*).

a, Normal columnar epithelium lining a gland within the cervical canal; *b*, cancerous cells derived immediately from it.

(2) The *cylinder-celled* or *glandular* cancer arises from the cervical glands, more rarely from the epithelium lining the surface of the cervical canal. The proliferating epithelium extends on the one hand into the lumen of the gland, breaking it up into smaller spaces, and on the other, into the connective tissue, bursting through the membrana propria (fig. 242). Hence we come to have tubular structures consisting of a lumen covered by epithelial cells arranged in several layers[1]; these are embedded in a scanty stroma. Sometimes the lumen disappears, and there is a solid plug which is with difficulty distinguished from a

---

[1] In the extremely rare form of malignant tumour of the cervix, so-called adenoma malignum, the epithelium is arranged in one layer. Adding together the cases recorded by Gebhard, Krukenburg, and Cullen, only nine cases of this condition have been described in the cervix. We shall refer to this under cancer of the body, where it is more common.

squamous-celled epithelioma. The type of cell-arrangement is that of a gland, only the cells are arranged in several layers, and in no definite order (fig. 243).

The individual cells differ from those of the normal epithelial glands, not only in their irregular form, but their nuclei are larger, richer in chromatin, and show karyokinesis more frequently. They sometimes contain spore-like hyaline bodies, which may be the result of degenerative changes or be parasitic protozoa (Müller). Non-specific microbes resembling yeast fungi have also been described by Russell, but it is doubtful whether they are of etiological moment.

In the neighbourhood of carcinoma the small-celled infiltration is noteworthy; this may be an actual inflammation due to septic infection from necrosis, or a simple reaction due to the irritation of the epithelial ingrowths.

POSITION.

Three Positions in Cervix.

While the histologist describes these two types of cancer,[1] the clinician finds that there are three places in the cervix where carcinoma first shows itself. (1.) It may begin as hard *nodules in the substance of the cervix* underneath the mucous membrane; these increase in size, come to the surface of the mucous membrane (fig. 244), and produce ulceration. (2.) More rarely does it commence in the *interior of the cervical canal* and spread along its mucous membrane so as to excavate the canal. (3.) It may appear *on the vaginal aspect of the cervix* as an ulcerating surface or as an irregular papillary tumour, which, extending downwards into the vagina, attains considerable size.[2]

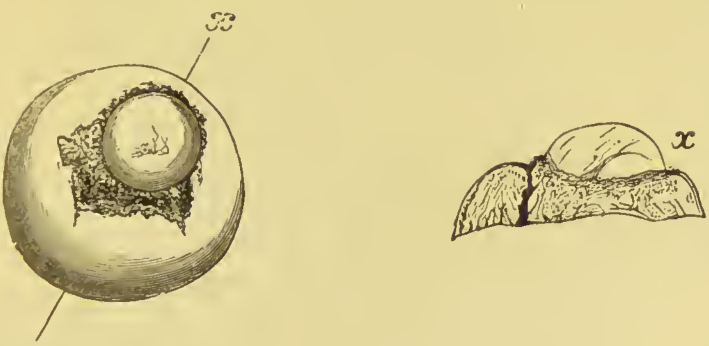

FIG. 244.

CARCINOMATOUS NODULE GROWING IN ONE LIP OF THE CERVIX AND PUSHING THE MUCOUS MEMBRANE OUTWARDS. The figure to the right is a section of the cervix made through the line x (*Schroeder*).

While the last two correspond to the two varieties—glandular cancer and epithelioma respectively, the first includes cases of both types.

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[1] On account of its rarity, we may put *endothelioma* on one side.

[2] So Veit distinguishes cancer of the vaginal portion, cervical cancer, and cancer nodules in the cervix. In addition to papillary, nodular, and excavating forms, Pozzi makes a fourth—the liminary or vaginal, in which it commences in the posterior fornix.

Form of Slow Ulceration not Malignant.

There is a form of slow ulceration on the surface of the vaginal portion which is not malignant. Sir John Williams[1] described this as "corroding ulcer of the os uteri:" it begins at the os and extends symmetrically downwards into the vagina, without hard or thickened edges, extending by simple ulceration or the formation of reddish raised tubercules which ulcerate; in one case, there was calcification of the internal iliac arteries; of three cases observed, the duration was in one for two years and in two for ten years. Some of these cases may be tuberculous.

There is also a form of adenoma which, though it is not malignant (*v.* p. 463), tends to become so. Fürst[2] has recorded a very interesting case of this in which the amputated cervix showed only the appearance of a cysto-adenoma, while eighteen months afterwards the patient died of true cancer of the cervix.

PROGRESS.

While in the initial stage we may recognise these three forms, after ulceration has occurred they pass into one another and are no longer distinguishable.

As regards the further progress, there are *three modes of spreading* of the disease; first, downwards into the vagina; second, upwards into the body of the uterus; and, third, into the connective tissue of the pelvis. This distinction is of importance from the operative standpoint, because while the first group gives scope for amputation of the cervix, and the second for extirpation of the uterus, the third shows the difficulties which beset operative treatment and its unsatisfactoriness in the majority of cases. The local dissemination of cancer through the connective tissue has recently demanded attention from its bearing on operative treatment by extirpation of the uterus. This affection of

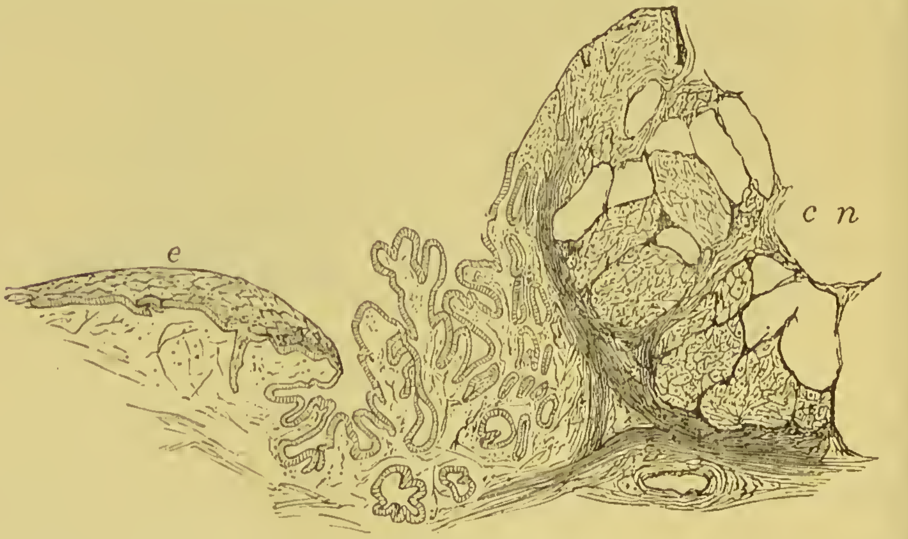

Fig. 245.

Microscopic Section of a portion of the Cervix Uteri seen in Fig. 244. *e* squamous epithelium in several layers; *c n* carcinomatous nodule; between these is seen a portion of inflamed mucous membrane covered with a single layer of epithelium (*Schroeder*).

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[1] Brit. Med. Jour., April 5, 1884.

[2] Ueber suspectes und malignes Cervix-Adenom: Zeits. f. Geb. u. Gyn., xiv., S. 352.

surrounding tissues has a bearing both on judging as to the suitability of cases for operation, and on the recurrence (or rather the appearance) of the disease after its apparent removal.

The *lymphatics* play the chief rôle in this dissemination, and it is to Poirier's researches as to their course, and the work of Seelig, Winter, Veit, and others, as to their implication in carcinoma, that we are chiefly indebted. From fig. 42 (p. 69) we see that the lymphatics from the body of the uterus pass through the upper part of the broad ligament to the lumbar glands, receiving on their way those from the ovary and Fallopian tube; while those from the cervix and upper part of vagina pass through the lower part of the broad ligament to the iliac or ilio-pelvic glands. A third and less important chain runs down the round ligament to the inguinal glands. The upper and lower lumbar glands receiving the uterine lymphatics are shown in fig. 41, in which the uterus is anteverted so that the group of vessels running to the

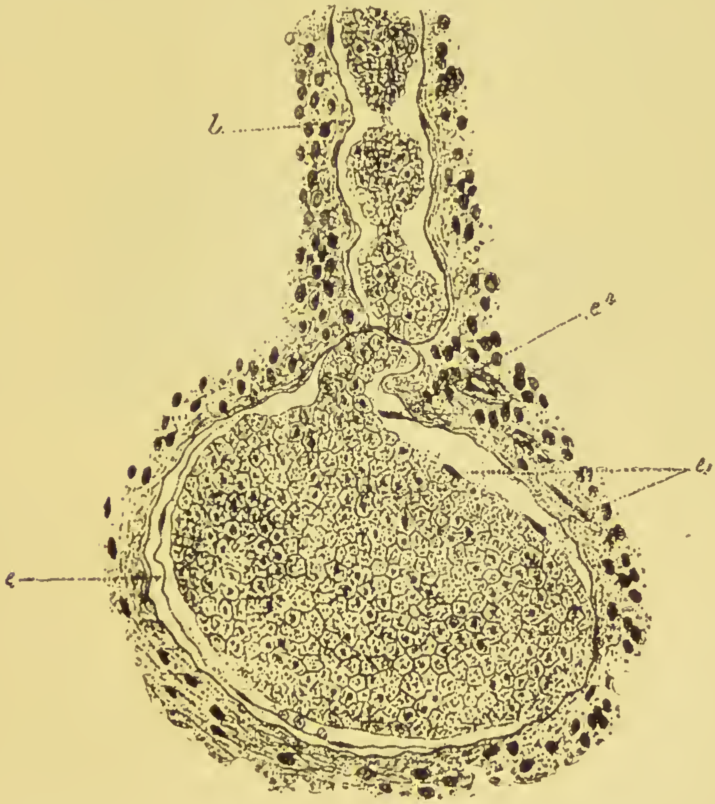

FIG. 246.

PLUG OF CANCER CELLS IN A LYMPHATIC VESSEL (*Seelig*); endothelium adherent to thrombus at e', detached at *e*.

lumbar glands, which are higher up on fig. 42, appear in fig. 41 as if lower down. These lumbar glands surround the aorta and vena cava, extending as far down as the bifurcation of the common iliac artery, where they become continuous with the iliac or ilio-pelvic glands. These last, which receive the cervical lymphatics, extend from the bifurcation of the common iliac artery downwards—in front of the internal iliac. Cancerous infiltration of the lumbar glands is difficult to recognise, though it may show itself through interference with the circulation. Cancerous ilio-pelvic glands, on the other hand, can be palpated per vaginam or per rectum. The inguinal glands, the most accessible, are very rarely affected in uterine cancer.[1]

In an early stage of cancer, nodules may be found separate from the original focus, sometimes in a chain. Seelig has shown that these nodules are plugs of carcinomatous tissue which have grown within the lymphatic vessel from carcinomatous epithelium carried by the lymph stream. The endothelium of the lymphatic vessel is not affected (*v.* fig. 246). In cervical cancer, extension takes place along the lymphatics, and especially in those of the outer muscular layers; while in cancer of the body, the lymphatics of the mucosa and then those of the inner muscular layers are involved. This slower and more limited extension explains the better results, as to recurrence, in hysterectomy for cancer of the body as compared with that for the cervix.

In cancer of the cervix, Abel and Landau[2] have found changes in the *mucous membrane of the body* also—not only those of chronic inflammation, but also of carcinomatous degeneration;[3] they further found microscopic changes exactly similar to sarcoma, but which might be the first stage of carcinoma of the body. Eckart,[4] on the other hand, found only hyperplasia of the glands with papillary proliferation into their lumen, *i.e.*, endometritis glandularis. Saurenhaus, from the examination of a still larger amount of material,[5] has shown that the changes, though extensive, are of a benign character, whether we characterise them as a hyperplastic endometritis or a simple adenoma.

Occasionally, when the growth comes to plug the cervical canal, the uterine secretion is dammed up and becomes purulent, constituting pyometra.[6]

As regards the uterine appendages, only very rarely does carcinoma affect the tubes or ovaries secondarily (Cullen).

[1] Russell figures an interesting specimen with nodules in the round ligament, evidently in the chain of lymphatics which follows it. Enlargement of the inguinal glands is frequent in affections of the vulva, but in such cases, infection is by another route.

[2] Ueber das Verhalten der Schleimhaut des Uteruskörpers bei Carcinom der Portio vaginalis: Archiv f. Gyn., xxxii., S. 271, and xxxv., S. 214.

[3] Secondary nodules in the body have also been noted by Pfannenstiel (Zent. f. Gyn., 1893, S. 414) and Benckiser (Zeits. f. Geb. u. Gyn., 1891, S. 337).

[4] From the examination of ten uteri extirpated by Kaltenbach for cancer of the cervix: Centralb. f. Gyn., 1888, S. 426.

[5] Fifty uteri extirpated for cancer: Centralb. f. Gyn., 1888, S. 755.

[6] As was found in 17 out of 227 cases by Bürckle: Inaug. Diss., Berlin, 1893.

EXTENSION TO NEIGHBOURING ORGANS.

In its further progress, the carcinomatous growth invades the surrounding organs. Pushing its way forwards in the cellular tissue between the *bladder* and the uterus, it involves the mucous membrane of the former; it first produces vesical catarrh, then sloughing of the walls, and finally vesico-vaginal fistula. The bladder is affected in a considerable proportion of cases; of 311 cases of carcinoma this occurred in 41 per cent., fistula resulting in 18 per cent. (*Gusserow*). From the position of the *ureters*, they are frequently involved. The carcinomatous growth may press upon the ureters near their point of entrance into the bladder; or it infiltrates their walls, and the consequent thickening produces constriction at the part affected. Dilatation of the ureter above thus results, which produces hydronephrosis and finally atrophy of the kidney (*see* fig 254). Roger Williams found in 72 post-mortem examinations, extensive renal disease in every case, double hydronephrosis with atrophy in 52, single hydronephrosis in 7, pyonephrosis in 8, and nephritis in 5. Artaud describes two degrees of kidney affection[1]; with moderate pressure the kidney is slightly enlarged and shows hypertrophy of the glomeruli and dilatation of the convoluted tubules with small-celled infiltration round both of these and the arteries; (2) with greater pressure dilatation of the ureters and atrophy of the kidney.

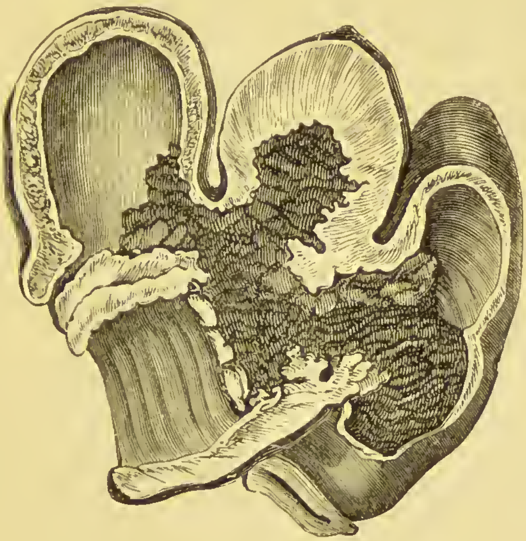

FIG. 247.

CARCINOMA beginning in the CERVIX UTERI, and ending in the production of recto-vesico-vaginal fistula (*Farre*).

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[1] Lancereaux considers ascending nephritis a constant phenomenon in cancer, being present from the earliest stages of the disease. Anat. des Mal. des Org. Genito-urin., 1884, p. 417.

More rarely does the carcinomatous infiltration extend backwards into the *rectum* and produce recto-vaginal fistula; of 282 cases the rectum was affected in 18 per cent., fistula resulting in 8·5 per cent. (*Gusserow*).[1] When both bladder and rectum have been opened into, a common cloaca is produced as in fig. 247.

Perforation into the *peritoneal cavity* is rare. The peritoneum is not simply pushed forward, but is taken up into the carcinomatous growth. As this process goes on, adhesions are constantly being formed between the layers of the peritoneum in front of the growth so that it does not project free into the cavity beyond. These adhesions further prevent the peritoneal cavity from being opened into when the carcinomatous mass breaks down.

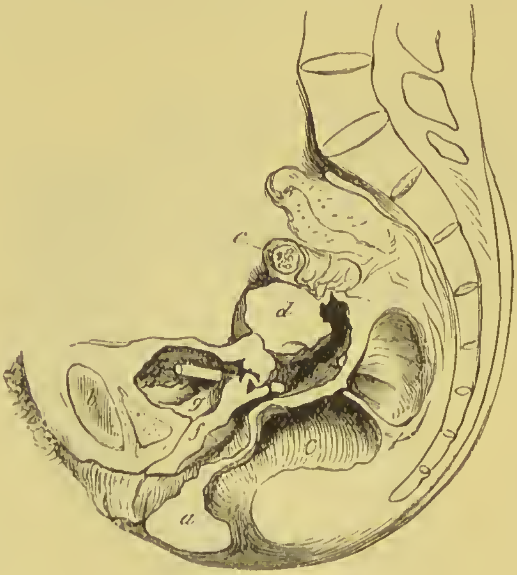

FIG. 248.

VERTICAL MESIAL SECTION OF PELVIS, FROM CASE OF CARCINOMA UTERI. *a*, Perineal body; b, Symphysis pubis; *c*, Rectum; *d*, Body of Uterus; *e*, Small fibroid; *f*, Urethro-vaginal septum; *g*, Bladder. A small tube passes between bladder and excavated cervix through a fistula (*Barbour*).

The accompanying sections (figs. 248, 249), made from post-mortem preparations, will serve to illustrate some of the points noted above.

Points to be noted in fig. 248.

Description of two Pelves with Cancer of Cervix.

1. Seat of disease in the *cervix*;

2. Complete destruction of the cervix and lower segment of the uterus;

---

[1] Fere and Carron (Statistics of Complications of Carcinoma Uteri in 51 post-mortems at the Salpetrière 1881-83) found extension to the bladder with fistula in 18, to the rectum in 7, and to the peritoneum in 9 cases.

3. Production of an irregular cavity from the extension of the disease in *three* directions through the cellular tissue—

(*a*) Behind the uterus,
(*b*) Between the uterus and the bladder,
(*c*) Between the vagina and the bladder;

4. The pouch of Douglas entirely obliterated and partially replaced by the carcinomatous excavation, the vesico-uterine pouch shortened by adhesions, perforation into the peritoneal cavity at one point;
5. Bladder small and contracted, carcinomatous fistula;
6. Rectum intact.

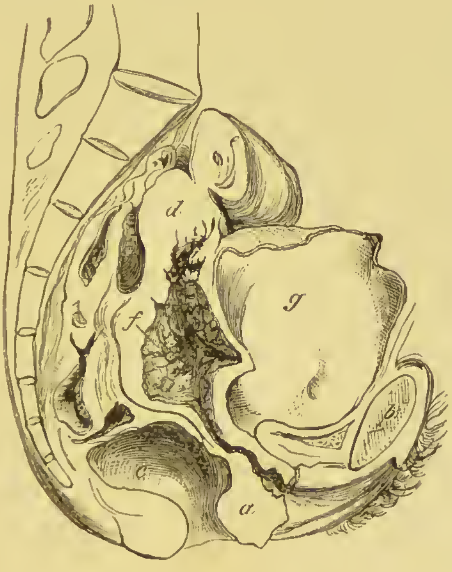

FIG. 249.

VERTICAL MESIAL SECTION OF PELVIS, FROM CASE OF CARCINOMA VAGINÆ ET UTERI. *f* points to vagina eroded by disease; *e* is a malignant growth attached to uterus. Other letters as in fig. 248 (*Barbour*).

Points to be noted in fig. 249.
1. Vagina (as well as cervix) affected, the nymphæ had a cartilaginous consistence, inguinal glands enlarged—although not shown in figure;
2. Extension of the disease along the mucous membrane of the uterus, excavating it though not destroying the walls to the same extent as in fig. 248;
3. Partial obliteration of the pouch of Douglas;
4. Bladder dilated through pressure on the urethra, its walls apparently not involved;
5. Rectum intact.

ETIOLOGY.

The female sex is more liable to carcinoma than the male. According to Sir J. Y. Simpson's statistics, the proportion is 2½ to 1. These statistics are drawn from the Annual Reports of the Registrar-General for England during the years 1847-1861. During that time there were 87,348 fatal cases of carcinoma, of which 61,715 were among women and 25,633 among men. For the year 1860 the deaths from carcinoma among men were ·97 per cent. of the total male mortality, among women 2·2 per cent. The cause of this greater relative frequency is connected with the development of the sexual organs in the female. Up to puberty, the mortality (from malignant disease) of the sexes is the same; afterwards, the relative proportion of female to male deaths gradually rises till it attains its maximum about the age of 50, after which it falls away again (fig. 250).

The diagram on p. 483 is based on the statistics of 91,058 deaths in Great Britain. It brings out three facts: the total number of deaths in each sex increases with age to a certain point; the increase among women is relatively the greater; it reaches its maximum at an earlier age with the female sex.

It is a remarkable fact that while the mortality from phthisis and tuberculous disease has diminished, that from cancer has increased by more than four times what it was half a century ago.[1]

The most frequent seat is the uterus, where fully one-third of the total cases occur; the next in frequency is the mamma.

Although the immediate etiology of carcinoma is unknown, there are certain causes general and local which favour its development.

1. The *general predisposing causes* are the following:—

Heredity;
Age;
Depreciation of the vital powers.

Race and Heredity.

The influence of *race* is brought out in Chisholm's statistics, which show that carcinoma is more than twice as frequent among the white population as among the black. As regards *heredity in families*, much less stress is now laid upon this than formerly.

According to Gusserow's statistics, in 1028 cases heredity was proven in only 79, that is in about 7·6 per cent. Schroeder, placing the statistics of Sibley and of Barker together, shows that heredity has been proven in only 8·2 per cent.; Picot places it at 13 per cent. These figures show that we cannot lay much stress on heredity as a predisposing cause. On the other hand, we must remember that these statistics are drawn principally from hospital reports, from a class of people who know little about the former history of their families.

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[1] *See* Roger Williams on "The continued increase of Cancer, with remarks as to its Causation." Brit. Med. Jour., 1896, ii., p. 318. In 1840, 1 in 129 of the total mortality was due to cancer; while in 1894 it had risen to 1 in 23. He attributes this to increase of industrialism acting injuriously on the health of the town population, and also to the increased consumption of meat.

TABLE AND DIAGRAM OF COMPARATIVE FATALITY OF CARCINOMA IN MALE AND FEMALE, ACCORDING TO AGE.

Out of 91,058 deaths from carcinoma

751 males,	773 females	died	under 15 years.
562 ,,	659 ,,	,,	from 15 to 25 years.
1244 ,,	3,176 ,,	,,	,, 25 ,, 35 ,,
2717 ,,	9,975 ,,	,,	,, 35 ,, 45 ,,
4973 ,,	16,668 ,,	,,	,, 45 ,, 55 ,,
7220 ,,	15,813 ,,	,,	,, 55 ,, 65 ,,
6286 ,,	11,840 ,,	,,	,, 65 ,, 75 ,,
2637 ,,	4,616 ,,	,,	,, 75 ,, 85 ,,
364 ,,	689 ,,	,,	,, 85 ,, 85 ,,
20 ,,	39 ,,	,,	above 95 ,,

(*Sir J. Y. Simpson*).

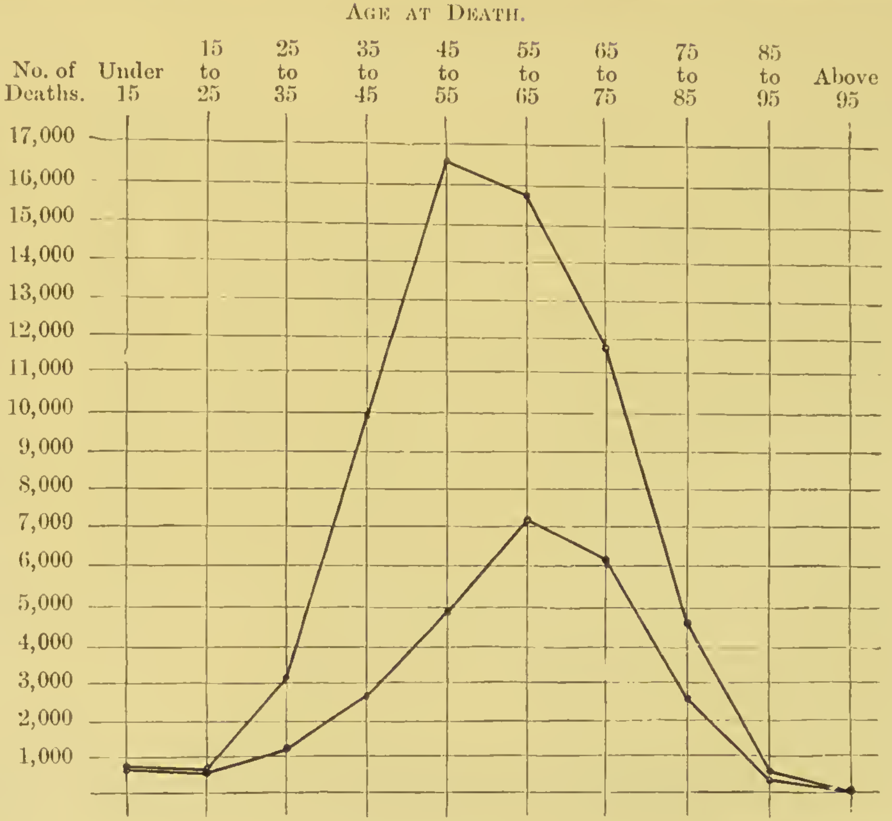

FIG. 250.

In the DIAGRAM, the *upper* line indicates mortality in the female, the *lower* that in the male.

TABLE AND DIAGRAM SHOWING FREQUENCY OF CARCINOMA ACCORDING TO AGE OF PATIENT.

NUMBER OF CASES.

Out of 2270 cases

2 were under 20 years.
81 ,, between 20 and 30 years.
476 ,, ,, 30 ,, 40 ,,
771 ,, ,, 40 ,, 50 ,,
600 ,, ,, 50 ,, 60 ,,
258 ,, ,, 60 ,, 70 ,,
82 ,, over 70 ,,
(*Gusserow*).

PERCENTAGE PROPORTION.

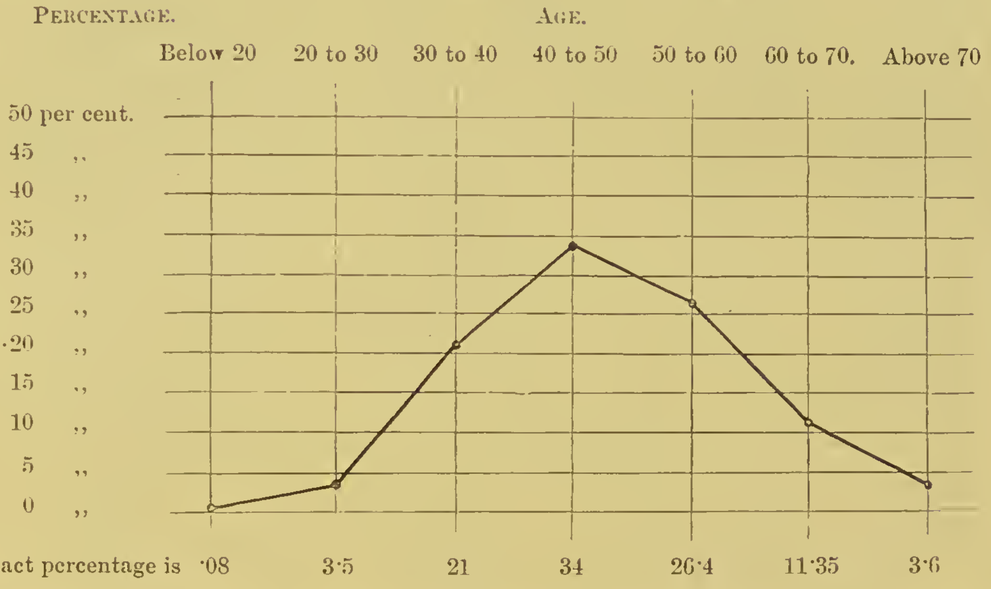

Fig. 251.

Age has undoubtedly a considerable influence upon the frequency of this disease. This is evident from the table given on page 484. Gusserow collected statistics of 2210 cases reported by various authorities. The mortality per cent. for various ages is represented by the curve in the diagram on page 484. From the table it is evident that carcinoma is very rare before puberty. The proportion of cases below 20 years (2 in 2270) is so small that it need not be taken into account. The first glance at the diagram would lead one to believe that the increasing frequency of the disease is due to the development of the functional activity of the sexual organs, but a more careful consideration shows that the increase continues and reaches its maximum after the latter has ceased. This table should be compared with that for Fibroid Tumours on page 424. Age.

Whatever tends to *depreciate the vital powers* favours the occurrence of this disease. We meet with it more frequently among the poorer classes, where there is insufficiency of food with privation and hardship. Schroeder contrasts, in this respect, the development of carcinoma with that of myoma. In his polyclinic among the poorer classes, the proportion of carcinoma to myoma was as 100 to 61; in his private practice among the wealthier, it was 100 to 332. Depreciation of Vital Powers.

2. The *local predisposing causes* are the following:—

Erosion of the cervix and protracted catarrh;
Repeated parturition.

The relation of *erosion and laceration of the cervix* to the development of carcinoma has been pointed out by Ruge and Veit, and also by Breisky. We draw attention to this point specially, because the most important differential diagnosis is that between long-standing inflammation and commencing malignant disease; and the possibility that the former may pass into the latter should always be kept in view.[1] Influence of Split Cervix.

Repeated parturition has an important influence. Carcinoma is much more frequent in multiparæ. Gusserow finds an average of 5·1 children to every case of carcinoma, which is a high average productivity. Whether this is due to the greater functional activity of the uterus or to the production of fissures with their resulting chronic inflammatory changes, is a more difficult question. Influence of repeated Parturition.

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[1] Williams, however, in his cases never found the disease starting in a tear, and thinks that there is no evidence that laceration plays any part in the etiology of cancer.

CHAPTER XLI.

CARCINOMA UTERI (OF CERVIX): SYMPTOMS AND DIAGNOSIS.

LITERATURE.

See Literature of Chapters XL. and XLII.

SYMPTOMS.

The *local* symptoms of carcinoma uteri are three—

Hæmorrhage,
Offensive discharge,
Pain.

There are in addition a considerable number of *general* symptoms, which arise secondarily.

As a rule, however, no symptoms are present in the first stage, that is, until ulceration sets in. In exceptional cases, when infiltration of the connective tissue or of the walls of the uterus has taken place at an early period, pain may be an early symptom; *there is no pain so long as the disease is limited to the cervix.* This entire absence of symptoms until the disease has already made considerable progress, is the reason of the great difficulty in ascertaining the period of its probable commencement. From the same cause, the patient does not seek relief till the possibility of eradicating the disease is much diminished.

LOCAL SYMPTOMS.

Hæmorrhage.

Hæmorrhage is usually the first symptom noticed by the patient. She observes that menstruation is more profuse than formerly. This, when the disease occurs late in life, she attributes to approach of the menopause. After the menopause, with some few exceptions, hæmorrhage is diagnostic of malignant disease. Patients should be instructed to seek advice at once *whenever the slightest bleeding occurs.* In other cases, before the climacteric, profuse hæmorrhage occurs irregularly between and independent of the menstrual periods. Sometimes the hæmorrhage is noticed only after exertion (as straining at stool) or after coitus. Sometimes the patient states that "the menstrual flow never entirely ceases;" which means that the vaginal discharge is always tinged with blood. The explanation of hæmorrhage in these earlier stages is to be found in the vascularity of the stroma of the new-formation.[1] It is rich in delicate vessels which readily rupture. In the later stages, hæmorrhage is not a prominent symptom unless a large vessel be accidentally eaten into. Death from hæmorrhage is rare.

Discharge.

The *discharge* characteristic of carcinoma is not present until ulceration has occurred. In the papillary form of epithelioma (cauliflower excrescence) there is a free discharge before the growth has begun to break down; this is of a watery character, has no odour, and is due simply to the transudation of serum. As soon, however, as ulceration occurs in any of the forms, there is a discharge containing the molecular debris of the breaking down tissue which gives it a characteristic and peculiarly offensive odour. In the rapidly growing forms of carcinoma there is an almost equally rapid molecular death of the newly-formed tissue due to fatty degeneration of the epithelial cells. In epithelioma this discharge is less marked, because there is less necrosis of tissue; but in adeno-carcinoma, especially in an advanced stage, it is quite characteristic. In fact, a diagnosis may be sometimes made merely from the odour which hangs about the person. At first the discharge is yellowish-white in colour, but afterwards from the decomposition of the fatty cells it becomes of a reddish-brown; if there is hæmorrhage, it will be tinged with blood.

Pain.

Pain is not such a constant symptom as is usually supposed. Some cases run their whole course without the patient's complaining specially of pain. It is not present so long as the disease is limited to the cervix; hence it is *of no use as a diagnostic of carcinoma of the cervix in its early stage*, unless the cellular tissue has been at the same time involved. But as soon as the new growth has extended upwards to the body of the uterus or to the cellular tissue of the pelvis, pain is produced through pressure on or actual lesion of the terminations of the nerves. The character of the pain varies. It is "a dull gnawing pain localised in the pelvis or back," or "a sharp pain shooting through to the back or down the thighs to the knees"; this last is caused by simple pressure on the crural and sciatic nerves, or, in the later stages, from affection of the cellular tissue of the nerve sheaths. Occasionally it is felt in the mammæ or other seats of uterine sympathetic pain. The intensity of the pain varies also in different cases; it is marked where there is more formation of new tissue and less ulceration, that is when there is more pressure on the nerve endings. Thus, if there has been much deposit between the uterus and the bladder accompanied by an increase of pain, we find that the pain diminishes when the mass breaks down and a vesico-vaginal fistula is formed. We may distinguish between pain due to the development of carcinoma, and that produced by the chronic peritonitis which accompanies it when the peritoneum becomes affected; the latter produces great sensitiveness of the abdominal walls to pressure, and a board-like rigidity from reflex spasm of the muscles.

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[1] Pozzi attributes the initial hæmorrhages to congestion of the uterus, apart from rupture of the vessels of the new growth; and compares it to hæmoptysis in phthisis.

GENERAL SYMPTOMS.

In addition to these local symptoms which are immediately due to the carcinomatous infiltration and degeneration, there are more general symptoms which arise secondarily.

Debility. First we mention *loss of flesh* and *general debility*. The patient may continue healthy and well-looking in the early stages; sometimes, one is surprised to find that the disease is already well advanced in a patient who to outward appearance is in perfect health. But, sooner or later, the drain on the system produces great emaciation. The patient also has a careworn expression, partly from this loss of flesh and partly from the constant pain; from this expression alone, known as the "cancerous facies," the diagnosis may sometimes be made. The *skin* acquires in the later stages a *dingy straw tint*, which when very marked is suggestive of jaundice. That disease may actually be present when there is secondary carcinoma of the liver, but this is rare. The colour is due to the anæmia, or (according to Barnes) to the absorption of decomposed fæcal matter (copræmia).

The wasting (marasmus) is occasioned not only by the drain of the new growth, but also by *disturbances of the digestive system* which arise in the course of the disease. Loss of appetite may amount to disinclination for food, and digestion is interfered with. This is produced at first sympathetically, as in other uterine disorders; but latterly it is due to gastric catarrh, constipation, the condition of the blood (anæmia and uræmia), and the unhealthiness of the atmosphere resulting from the offensive discharges.

There is, further, *painful micturition and defæcation* according to the extent to which the bladder and rectum are involved. The latter is almost always present, as the rectum, whenever it is distended, presses upon the cancerous growth. When fistulæ are produced, the urine and fæces pass per vaginam.

Pruritis vulvæ frequently results from the acrid and irritating discharge, and from the dribbling of the urine from a fistula.

DIAGNOSIS.

As the patient does not seek advice till cancer has begun to ulcerate, the physical signs have by that time become well marked and the diagnosis is usually easy.

Vaginal Examination.

On making a *vaginal examination*, the finger feels the enlarged, thickened, irregular, everted lips of the cervix spreading like a mushroom in the vagina (described by Malgaigne as "champignons cancéreux"). Sometimes a distinct tumour is present, the form of which is sufficiently indicated by the term cauliflower excrescence (*see* fig. 252). In other cases the finger feels an irregular ulcerated surface in the position of the cervix, soft and friable with hard and unyielding margins. The examining finger is stained with blood, and the odour of the discharge cannot fail to be recognised. If there is any doubt as to diagnosis, a fragment should be removed and examined microscopically. The appearance of a fibrous stroma with alveoli which contain irregular cells of an epithelial type with one or more large nuclei, will confirm the diagnosis of carcinoma.

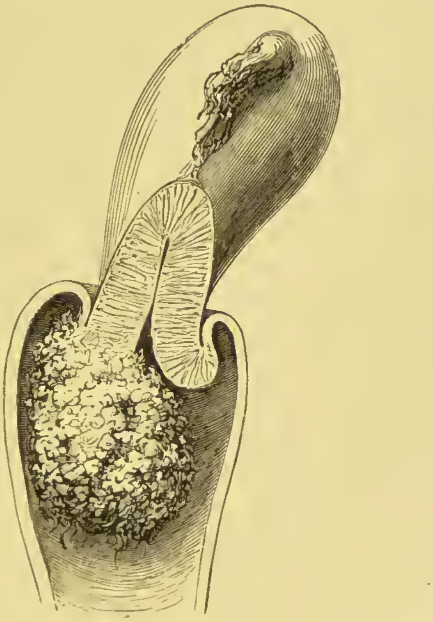

Fig. 252.

Cauliflower Excrescence growing from the Cervix Uteri (*Sir J. Y. Simpson*).

The value of the microscope in the diagnosis of cancer has given rise to considerable difference of opinion. While Williams[1] and Griffith[2] emphasise its usefulness, Thornton[3] and Herman lay more stress on clinical observation, the former showing the risks of "partial operation," as he characterises the snipping off of portions for microscopic examination. Clinical observation, corrected and supplemented by microscopic examination, is best. While microscopic examination may not in many cases be of value, in a certain proportion of cases it is conclusive; and its utility comes in just at that early period where clinical investigation feels its weakness. The microscopical examination of scrapings removed by the curette is of much less value than of pieces excised, for although the histological characters of epithelioma are so distinctive that it may be recognised from the fragments, it is difficult to be sure of adeno-carcinoma without proof of the invasion of deeper structures which can only be got from a large piece of tissue.

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[1] *Op cit.*

[2] Early Diagnosis of Cancer of the Uterus: Brit. Med. Jour., 1896, Vol. i., p. 264.

[3] The Early Diagnosis of Malignant Disease, etc.: Brit. Med. Jour., 1896, Vol. i., p. 261. *See* also Jessett on the Early Diagnosis of Malignant Disease: Brit. Gyn. Jour., 1896-97, p. 327.

Speculum. The *speculum* need not be used for the recognition of carcinoma, except in its early stage or to ascertain more exactly the seat and extent of the growth. If the disease be far advanced and the diagnosis certain, the introduction of it causes unnecessary pain and hæmorrhage.

Spoon. Sinclair[1] recommends the use of the *sharp spoon* in diagnosis, as chronically inflamed tissues do not break down under it, but this belongs rather to its differential diagnosis from chronic inflammation.

Rectal Examination. The *rectal examination* is valuable, and in these cases should always be carefully carried out. It gives us important information in two distinct classes of cases. First, in early carcinoma or in cases where there is a suspicion of commencing carcinoma, the cellular tissue of the pelvis should be carefully examined to ascertain whether any localised deposit or enlarged glands can be felt; this can be done most easily by the rectal examination. If it is desirable to introduce two fingers into the rectum or if the examination causes much pain, the patient should be narcotised. Second, in cases of advanced carcinoma where the vaginal examination is difficult on account of the hæmorrhage and pain which it occasions, a more thorough examination can be made per rectum. The finger can reach higher up than per vaginam, and thus we can ascertain the extent of the carcinomatous deposit and the size and mobility of the uterus. The condition of the rectal mucous membrane itself is observed at the same time, to ascertain whether it is already involved in the disease. In some cases the rectal examination is the only one possible, as in the case of carcinoma vaginæ represented at fig. 249 where the deposit round the ostium vaginæ made the introduction of the finger impossible.

DIFFERENTIAL DIAGNOSIS.

The following are the most important lesions from which carcinoma is to be differentiated:—

Hypertrophy of the cervix, with induration and occluded follicles;
Papillary erosion or ectropium, with cicatricial tissue;
Syphilitic ulceration, condylomata on the cervix;
Small fibroid in the cervix, sloughing polypi;
Tuberculous ulceration;
Retained portions of placenta or membranes;
Sarcoma of the cervix.

As regards the first two of these, it is evident that carcinoma resembles them only at an early stage. But it is precisely at this stage that a correct diagnosis is all important for treatment. We should also remember (as Ruge and Veit have pointed out) that these conditions may be at once the result of chronic inflammation and the starting-point of malignant disease. The statement of the patient that the symptoms have existed for a long time, should not throw us off our guard. In *all* cases in which a patient *over forty years of age* seeks advice *with symptoms referable to the pelvis, a careful examination should be made.* We may thus accidentally discover carcinoma in an early stage, while still within the possibility of radical treatment. If the carcinomatous infiltration be general, it cannot be distinguished, except by microscopical examination, from chronic induration. When localised, the diseased part is distinctly marked off from the adjoining tissue, shows a difference in its level, and is of a slightly yellow colour with granular yellowish-white inequalities.[1] Where there is only suspicion of carcinoma, there is no harm in excising a portion of the suspected part and submitting it to *microscopic investigation.* A careful examination per rectum of the pelvic cellular tissue should always be made as mentioned above.

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[1] *Loc. cit.*

Importance of Pelvic Examination in Cancer.

A superficial ulcerating epithelioma might be mistaken for a simple erosion, but has *thickened infiltrated edges.* The latter may, however, pass into the former.

Condylomata on the cervix simulate epithelioma, but they disappear under appropriate treatment. Syphilitic ulceration produces sometimes deep excavation, even a rectal fistula. This at the first glance might be taken for carcinoma, but more careful examination and inquiry into the history of the case will remove all doubt.

Small myomata are more sharply defined than a carcinomatous nodule of the same size, because the surrounding tissue is not infiltrated.

A tuberculous ulcer is distinguished by its softer, more velvety surface and smoother edges; there is usually tuberculosis present elsewhere in the body. If a piece be excised, giant cells and in some cases bacilli can be detected.

When a small submucous fibroid or a cervical polypus has ulcerated, it presents appearances similar to an ulcerating carcinomatous nodule. The former however is firmer, and fragments cannot be broken off by the finger-nail, while the latter is friable and breaks down easily.

Carcinoma in the Puerperium.

The possibility that carcinoma may be first noticed during the puerperium should be remembered. In such a case it is more likely to be in the body of the uterus, as cancer of the cervix hinders conception. Even in the body, it is rare in the puerperium; and cases described as such are usually Deciduoma malignum (*v.* Chap. XLIII).

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[1] Stratz—Zur Diagnose des beginnenden Carcinoms an der Portio: Zeits. f. Geb. u. Gyn., Bd. xiii., S. 89.

Sarcoma of the cervix is a very rare condition. Sarcomatous tumours are softer and grow more rapidly than carcinomatous. A positive diagnosis can only be made after microscopical examination.

PROGNOSIS.

The prognosis in carcinoma is always very grave. The occurrence of spontaneous cure is extremely doubtful. There is one apparently well-authenticated case recorded by Habit.[1] Another is mentioned by Barnes,[2] in which there is some doubt as to the correctness of diagnosis. The prognosis as to the probable duration of life will depend on the extent to which the disease has already advanced and the possibility of checking its progress or even extirpating it altogether by operative interference. With regard to tho results of operative interference, see under Treatment.

As regards the duration of the disease if not interfered with, there is a slight difference of opinion. This may be explained by the variable period in the course of the disease at which the symptoms appear. Sir J. Y. Simpson gives the probable duration of life after the detection of the disease as from 2 to $2\frac{1}{2}$ years; Gusserow and Schroeder give it as from 1 to $1\frac{1}{2}$; while, according to Fordyce Barker, it is as long as 3 years and 8 months. The statistics of H. Arnott, drawn from 57 carefully observed cases, give the duration, after the first symptom (usually a flooding), of true cancer as 53·8 weeks; of epithelioma, 82·7 weeks. We may say therefore to the patient's friends that the disease will run a course of from one to two years. It is better not to tell the patient herself what her trouble is, though its serious nature should not be disguised.

CAUSES OF DEATH.

The causes of death, arranged in order of importance, are the following:—

Exhaustion,
Uræmia,
Peritonitis,
Septicæmia,
Hæmorrhage,
Venous thrombosis.

Exhaustion.

Exhaustion, under which we include *marasmus*, is the result partly of the drain on the system and partly of the inability to take food.

Uræmia.

The importance of *uræmia* as a frequent cause of death has only recently been recognised.[3] According to Seyfert, in the majority of cases death results from it. It is due to compression of the ureters, as already described under Pathology. It may be acute, accompanied by coma and convulsions. Fig. 253 shows the kidneys and ureters from a patient who had two convulsions before death, and we have recorded another case in which convulsions were present.[1] More generally it is chronic, and shows itself in the dulness of the patient, occasional headache, and decreasing sensibility to pain — which diminishes suffering as the disease approaches its termination.

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[1] Sydenham Society's Year Book, 1864, p. 401.

[2] Barnes: Diseases of Women, London, 1878.

[3] Säxinger: Prager med. Vierteljahrsschrift, Bd. i., S. 103.

Peritonitis. *Peritonitis* is sometimes the cause of death, but not so frequently as one would suppose; the disease is prevented from extending to the peritoneum generally by the adhesions which are formed. When peritonitis occurs, it is localised and chronic; in some cases, however, a general peritonitis is set up which proves fatal. **Perforation.** *Perforation* may take place from the sudden giving way of adhesions; the escape of the carcinomatous debris into the peritoneal cavity produces death from shock or septic peritonitis. The preparation shown at fig. 254 was taken from a patient in whom the cause of death was *rupture of the uterus.* The case is reported and the preparation described by A. R. Simpson (*op. cit.*, p. 276). There was carcinoma of the cervix which

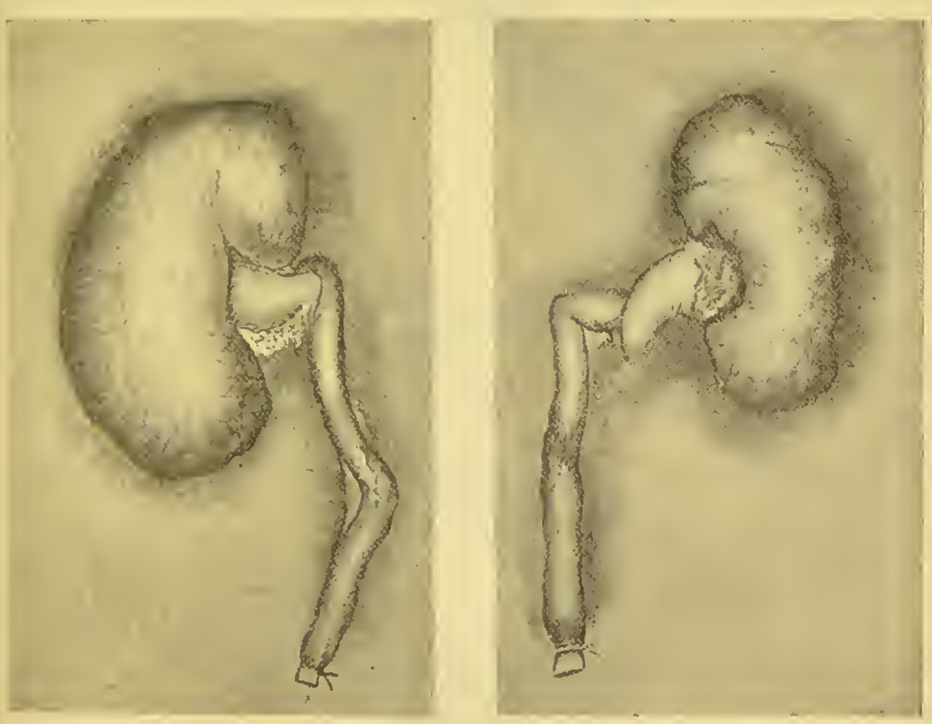

FIG. 253.

KIDNEYS AND URETERS, from a case of Cancer of Uterus with Uræmic Convulsions.

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[1] Edinburgh Hospital Reports, 1895, p. 675

had contracted the lumen of the canal; the cavity of the uterus was expanded, the walls being thinned out; at the fundus "was a small perforation about the size of a pea, with thin edges," through which fluid had escaped and set up peritonitis which rapidly proved fatal.

Septicæmia.

Septicæmia suggests itself as a likely cause of death. We are familiar with it as produced in the puerperal condition: it is explained by the fact that, at that time, there is abundant means for absorption in the numerous lymphatics and large veins which have been recently lacerated; hence, whenever septic matter is present, there is great risk of septicæmia. Similar conditions exist in carcinoma, during the progress of which the blood-vessels are eroded and their extremities bathed in putrid matter. Barnes has drawn special attention to this as a source of blood-poisoning; according to Eppinger's[1] observations its occurrence is rare, and this he ascribes to the diminution of the absorptive power of the eroded vessels.

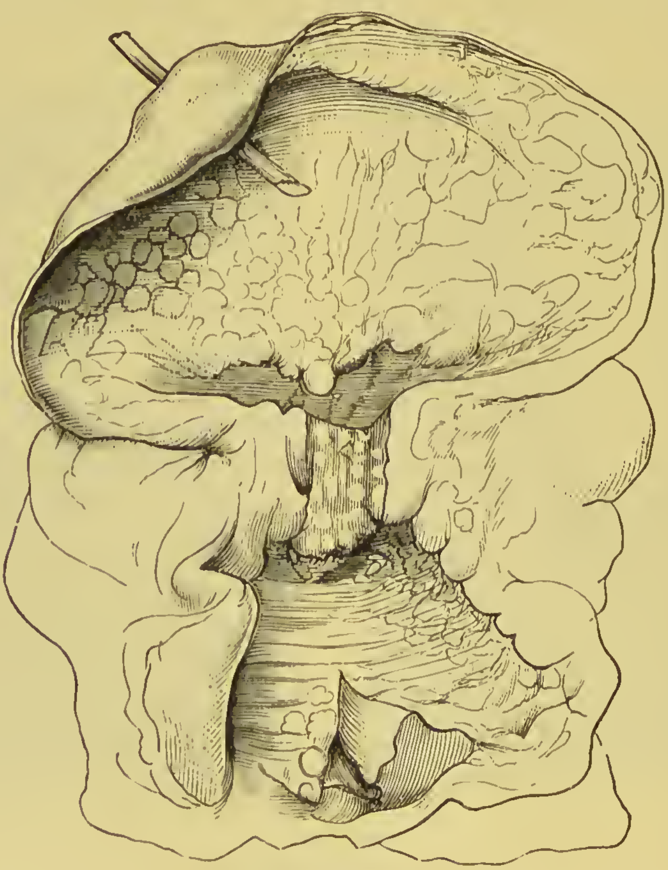

FIG. 254.

CARCINOMA OF THE CERVIX LEADING TO OCCLUSION OF OS UTERI, dilatation of uterus and perforation (*A. R. Simpson*). Uterus and vagina laid open; a quill is passed through the perforation.

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[1] Prager med. Wochenschrift, 1876, S. 210.

Hæmorrhage is in very rare instances immediately fatal. As already pointed out, though it is important as an early symptom, it occurs less frequently and is less abundant as the disease advances. If a large vessel be suddenly opened into, a fatal hæmorrhage may follow. Hæmorrhage.

Venous thrombosis, due to mechanical compression of the veins, sometimes occurs; and a clot may be detached producing embolism in the lungs. Fatty degeneration of the heart is, sometimes, also present. Thrombosis.

Patients with cancer have also died of tetanus.[1]

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[1] *See* case of Hofmeier: Centralb. f. Gyn., Bd. xi., S. 171.

CHAPTER XLII.

CARCINOMA UTERI (OF CERVIX): TREATMENT.

LITERATURE.

Barbour—Vaginal Hysterectomy by Doyen's Method: Scot. Med. and Surg. Jour., July 1897. *Currier, And. F.*—Removal of the Uterus for Cancer: N. Y. Med. Jour., Vol. xxxiv., p. 494. *Cullen*—Cancer of the Uterus, etc.: Henry Kimpton, London, 1900. *Duncan, W. A.*—On Extirpation of the entire Uterus: London Obstet. Trans., 1885, p. 8. *Freund*—Samm. klin. Vorträge, Nr. 133; and Centralb. f. Gyn., N. 12, 1878. *Franz*—The Value of the Abdominal Operation in the Treatment of Uterine Cancer: Brit. Gyn. Jour., 1903, p. 134. *Frommel*—Die Radical Behandlung des Uteruscarcinome: Veit's Handbuch d. Gyn., Wiesbaden, Bergmann, 1899. *Gessner*—Palliative Behandlung des inoperativen Carcinoms: Veit's Handbuch d. Gyn., Wiesbaden, Bergmann, 1899. *Gusserow*—Die Neubildungen, etc.: Stuttgart, 1885, S. 199. *Hegar und Kaltenbach*—Die Operative Gynäkologie, S. 391. *Hofmeier*—Zur Statistik des Gebärmutterkrebses und seiner operativen Behandlung: Zeitsch. f. Geb. und Gyn., Bd. x., S. 269. *Kelly, Howard A.*—Operative Gynecology: Henry Kimpton, London, 1898. *Lewers*—On the supra-vaginal amputation of the cervix uteri, etc.: Lancet, 1888, i., p. 464; also, Cancer of the Uterus, London, 1902. *Pawlik*—Zur Frage der Behandlung der Uteruscarcinom.: Wiener Klinik, 1882, Hft. xii., S. 425. Ueber die endgültige Heilung des Carcin. Cervicis Uteri durch Operation—Zeits. f. Geb. u. Gyn., Bd. xiii., S. 360. *Sänger*—Zur vaginalen Totalextirpation des carcinomatösen Uterus: Archiv f. Gyn., Bd. xxi., Hft. 1. *Schroeder*—Charité Annalen: V. Jahrgang, S. 343. Zeitschrift für Geburtshülfe und Gynäkologie: B. iii., S. 419; B. vi., Heft 2, S. 218. *Simpson, A. R.*—Carcinoma Uteri; Contributions to Obstetrics and Gynecology, p. 261: Edinburgh, A. & C. Black. Case of Extirpation of the Cancerous Uterus through the Vagina: Edin. Obst. Trans., Vol. vii., p. 136. *Simpson, Sir J. Y.*—Diseases of Women, p. 170: Edinburgh, 1872. *Sims, Marion*—The Treatment of Epithelioma of the cervix uteri: American Journ. of Obst., July 1879. *Sinclair, W. J.*—Malignant Diseases of the Uterus; Clifford Allbutt's System of Gynecology: London, 1896. Carcinoma in women, etc.: Brit. Med. Jour., 1902, Vol. ii., p. 321. *Thornton, J. Knowsley*—Article, Hysterectomy in Clifford Allbutt's System of Gynecology: London, 1896. See also references under Operations and Results in the text.

The treatment of carcinoma ought to be regarded in two aspects: first, as treatment of *the symptoms*; second, as treatment of *the disease*. Again, the treatment of the disease may be either *palliative* or *radical*.

We need not discuss here the vexed question whether carcinoma is a constitutional or a local disease. It cannot be too strongly impressed on the practitioner that, as far as our present experience goes, in attacking the disease itself he must rely upon *surgical* and not on *medical* treatment. Our aim ought to be the removal of the disease and not merely the alleviation of the symptoms. To remove it completely we must recognise it early.

For the early recognition of cancer two points must be insisted on. The profession should educate the community to seek advice in all cases of irregular bleeding about the menopause. Women should be trained to seek advice as a matter of course whenever this symptom is observed. The physician, on his part, should make a careful note of all cases of suspicious thickening of the cervix, and follow the case carefully for some months until he has satisfied himself that it is not commencing malignant disease.

Not less important than early recognition is complete removal and that without delay. In the uterus, more readily than in the mamma, does carcinoma get beyond the reach of the operator. In carcinoma mammæ, we can excise not only the breast but also the axillary glands if these should be already implicated. But, in carcinoma uteri, removal of the pelvic glands is a serious operation, the results of which are doubtful.

Although much skill has been shown in a variety of operations for dealing with cases in which the disease has extended beyond the uterus, it is still *sub judice* whether the results are such as to justify the risks of a radical operation.

We shall consider, first, the treatment of the symptoms; because, in the majority of cases, when the patient comes under our notice, the disease itself has already got beyond our reach.

TREATMENT OF SYMPTOMS.

These are hæmorrhage, offensive discharge, pain.

HÆMORRHAGE.

Use of Ergot.

In the treatment of hæmorrhage internal remedies are not of much service. Ergot and adrenalin may be tried, but local applications are of more value. Instead of the ordinary antiseptic injection a solution of formalin (1 in 500) may be used; it hardens the tissues and lessens the liability to bleeding. Other astringents such as alum or acetate of lead may be tried. Stimulants should not be used, and sexual abstinence enjoined.

The Vaginal Tampon.

When we are called to a case of hæmorrhage from carcinoma the vagina should be completely and thoroughly plugged; for this a speculum is necessary, and if pledgets of wool are used they should be tied on a string to facilitate removal. The plug should be soaked in an antiseptic solution, as it is to be left in for some days. Iodoform gauze, in a continuous narrow strip, is the best material for plugging. The use of caustics, cautery, and curette, will be considered under Operative Treatment.

OFFENSIVE DISCHARGE.

This is best treated by astringent and antiseptic injections. These should be used frequently, as it is important to keep down the unpleasant odour and make the patient's surroundings as comfortable as possible. If the discharge be plentiful and not very offensive, as in the cauliflower excrescence, the indication is more for the use of astringents like sulphate of alumina and iron (4 grains to the oz.). Tannin or sulphate of zinc can also be used, and it is well to change the astringent occasionally. If there is much necrosis of tissue with offensive discharge, corrosive sublimate (1 to 2000) is required. Solution of bromine (1 of the B.P. solution to 3 of water) is a good disinfectant, but its odour is disagreeable. Lysol is more pleasant. Condy's fluid is largely used, but it is only deodorant not disinfectant.

Chian turpentine, which was introduced by Clay as a cure for cancer, does good in some cases in checking the discharge. It may act as a styptic and antiseptic. It is given in emulsion or pills (4 to 8 grains).

The skin round the external genitals should in all cases be protected from the acrid discharges, as the irritation is a source of discomfort. A lotion of equal parts of olive oil and glycerine or of olive oil and lime water, applied after each vaginal injection, serves this purpose well.

PAIN.

Use of Opium.

This can be effectually relieved only by some preparation of opium; it is well to delay the habitual use of this remedy as long as possible, as it interferes with digestion and nutrition. It may be given as a morphia suppository ($\frac{1}{4}$ of a grain in each) per rectum, or as the liquor morphinæ hydrochloratis by the mouth. We obtain its action most surely and quickly and with the least disturbance of the digestive system by giving it hypodermically. It is desirable to change the narcotic, as even opium gradually loses its effect; the hydrate of chloral, in 20 grain doses, may be used as a substitute. Various local anodynes have been suggested, but are of little use.

General Treatment.

Attention to the *general condition* of the patient is very important. The three main points are to give a sufficient quantity of nutritious and easily digestible food, to keep the bowels regular, and to have the atmosphere healthy and the surroundings cheerful. Food should be given in small quantities and frequently; milk, eggs, and beef-tea should be substituted for more solid food as soon as digestion fails. In the later stages, the bowels should be evacuated by enemata rather than by purgative medicines. The room should be well ventilated by day and night, and the vaginal injections repeated frequently. Gusserow recommends that during the night a piece of waterproof sheeting be tied round the patient's waist to keep down the disagreeable odour.

X Rays in Cancer.

The treatment of cancer by the X-rays belongs rather to the relief of symptoms than to the treatment of the disease. There is no doubt as to the relief of symptoms afforded in some cases, but it is questionable whether the growth is arrested. In making the application a short Fergusson speculum, made of metal or lined with platinum, is passed into the vagina so as to expose the growth, and at the same time protect the normal tissues. The skin round the speculum (vulva, mons veneris, and thighs) must also be protected with lead foil. The diseased surface is exposed to the rays for ten minutes every second day, the tube being held 4 or 5 inches from the vulva.

TREATMENT OF THE DISEASE.

As before stated our aim here is extirpation. If complete removal be possible, carcinoma will be no longer the incurable disease which haunts the mind of the patient and baffles the skill of the practitioner. The principles of treatment can be best understood by considering the progress of the disease as consisting of three stages: (1) when the disease is present as a germ infiltrating healthy tissue; (2) when the germ has developed into a tissue having the typical carcinomatous structure; (3) when this newly-formed tissue breaks down. The accompanying diagram (fig. 255) illustrates this progress. The three stages are represented by three zones.

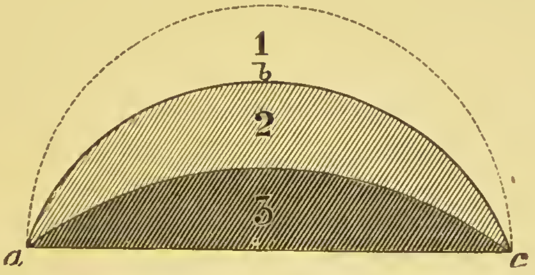

FIG. 255.

DIAGRAM TO ILLUSTRATE THE SPREADING OF CARCINOMA. 1, Healthy tissue infiltrated with germs of Carcinoma—area of lymphatic infection; 2, Carcinomatous tissue fully developed; 3, Carcinomatous tissue breaking down.

Spread of Cancer.

The extent of zone 1 is not well defined, for we have no means, unless with the microscope, of ascertaining how far the surrounding tissue is infiltrated. The existence of this area has been emphasised recently by the work of Seelig and others (p. 477) who have shown that beyond the area where the disease can be recognised by touch and sight, there is lymphatic affection (fig. 246). The area of zone 2 is more definite; the line *a b c* is well marked, for the carcinomatous tissue when fully formed has characteristics by which it can be recognised from the surrounding healthy tissue by its physical signs. Zone 3 represents the third stage, in which the immediate danger to the patient lies. It is not the *formation* of the carcinomatous tissue which is dangerous, but its *ulceration* with accompanying hæmorrhage and exhausting discharge.

From these facts we deduce the following principles of treatment. *First*, to effect radical cure we must remove zone 1, as well as zones 2 and 3; *i.e.*, we must remove not only the tissue which is evidently carcinomatous, but also all the surrounding tissue which may contain germs of the disease. Sometimes by a chance the operator has done this through keeping well clear of the evidently diseased part, and thus we can explain the recorded cases of cure. *Second*, we may anticipate the natural process of breaking down, with its accompanying exhausting results and risks of a fatal hæmorrhage, by destroying the newly-formed carcinomatous tissue as far as it is recognisable. We shall thus save the patient from the effects of the disease until zone 1 has passed into the condition of zone 2 and is beginning to break down. Thus we explain the temporary benefit (for a period measurable by months) derived from the partial excision of the new growth. *Third*, the application of caustics alone may effect the destruction of area 3; but we are not so sure that we are removing the *whole* up to line *a b c*, as we are when using the knife or other cutting instrument. The latter means is preferable because we can make certain that we have reached this line in all cases where it is attainable by operation. *Fourth*, the use of the knife and the application of caustic to the raw surface will, where the disease has spread far, be more effectual than the use of the knife alone; the caustic will now without doubt operate on the area of zone 1 and destroy so far the germs of the disease.

There are three methods of operative treatment:—

1. Scraping out of diseased tissues, with or without application of caustics,
2. Amputation of the cervix,
3. Excision of the uterus.

SCRAPING OUT OF DISEASED TISSUE, WITH OR WITHOUT CAUSTICS.

We have recourse to this means of treatment (1) in cases in whicl the disease is not of a form suitable for amputation—when it does no form a pedunculated mass but is spreading along the mucous membran of the vagina, (2) in cases which are too far advanced for amputatio of the cervix. This method has the advantage that the carcinomatous tissue is soft and friable compared with the surrounding connective tissue, and can be therefore easily scraped away; on the other hand, there is the danger of exciting metastasis.

After scraping away obviously diseased tissue with a spoon (fig. 256) or burning it out with the cautery, the cavity is plugged with iodoform gauze.

In addition to scraping, strong caustic may be applied, to cause the carcinomatous tissue to slough out. Nitric acid or an alcoholic solution of bromine[1] (1-5) have been used, but chloride of zinc[2] (as a solution of 1 in 2 or in paste) is the best. Below the tampon of zinc chloride the vagina must be packed with pledgets soaked in an alkali (bicarbonate of soda) to neutralise the superfluous acid that runs down. The packing is left in for six days; after which antiseptic injections are given until the slough comes away several days later.[3]

AMPUTATION OF THE CERVIX.

This operation is called for by two sets of circumstances: (*a*) when the disease is as yet limited to the cervix and there is a distinct line of demarcation above, so that in operating we can cut through healthy tissues; (*b*) when it has spread so far that, although we cannot operate upon healthy tissue, we are yet justified in removing as far as possible the projecting mass.

The means of amputation are the following:—

Écraseur, or galvano-cautery;
Knife and Scissors.

I. Écraseur, or Galvano-Cautery.

Both of these possess the advantages that they are easy of application and cause less hæmorrhage than the knife, although with the latter we can follow more certainly the line of demarcation. The écraseur has the advantage that it is easily portable, requires no preparation, and is always ready when wanted. In using these, the cervix is laid hold of with volsellæ and drawn down to the vulvar orifice. The chain or wire (if a galvano-cautery[4] is used) is placed around the cervix as far above the limits of the disease as possible; and tightened slowly so as to

Ecraseur and Galvano-Cautery compared.

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[1] Recommended by Routh (Brit. Med. Jour., Feb. 1880) and Wynn Williams (Lond. Obstet. Trans., Vol. xii., p. 249).

[2] Recommended by Van de Warker (Amer. Jour. Obstet., March 1884), and by Fränkel who had a case after its use without recurrence during seven years (Beitr. zur Geburts., Berlin, Bd. ii., S. 23).

[3] This method has been brought forward again recently by Meinart, who uses a paste of equal parts of zinc chloride and starch — Treatment of Inoperable Uterine Cancer: Münchener Med. Wochensch., 1902, No. 39.

[4] Pawlik gives the after-history of 136 cases operated on by C. Braun in the Vienna Clinique; the mortality from the operation was 7⅓ per cent. 26 of the cases were without recurrence two years after operation—the longest period being 19½ years.

crush or burn through the tissues rather than cut them. After amputation, if there is much hæmorrhage, a styptic may be applied to the stump; and the vagina is firmly packed. The packing is not removed for some days as there is danger of secondary hæmorrhage.

II. Knife and Scissors. The advantage of this method of operating is that it allows the operator to follow the line of demarcation between the diseased and the healthy tissues; if in the course of the amputation he finds the carcinomatous new-formation extending higher up than he anticipated, he can remove as much more of the suspected part as may be necessary.[1]

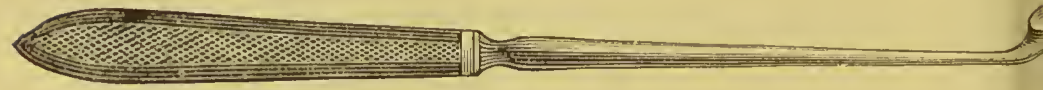

Fig. 256.

Simon's Sharp Spoon.

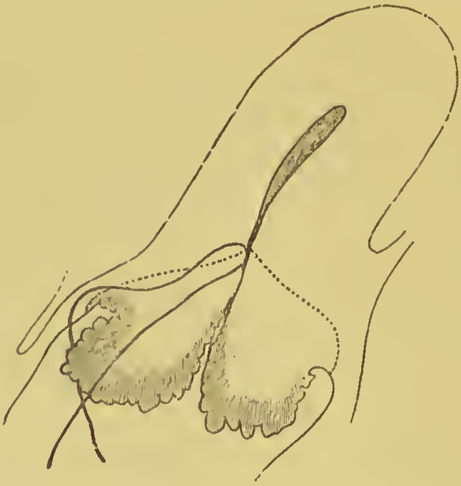

Fig. 257.

Line of Incision and Position of Sutures in the Supra-vaginal Amputation of the Cervix (*Schroeder*).

The cervix may be amputated at the level of the fornix, as described at p. 302. In the *supra-vaginal* amputation,[2] the cervix is drawn down with a volsella, the knife carried round the anterior fornix, and the bladder separated from the cervix almost up to the utero-vesical pouch of peritoneum. The cervix is now carried forward and the posterior fornix incised in a similar way, the ends of this incision being made continuous with that made anteriorly. Should the peritoneum of the pouch of Douglas be cut into, it is of no consequence. The clearing of the cervix from the cellular tissue above the lateral fornices may be more difficult, from the firmness of the connective-tissue and the presence of the branches of the uterine artery. Hæmorrhage is best prevented by transfixing the tissues with needle and ligature; the cervix being thus freed, the anterior lip is removed and stitched as in fig. 257, the forceps-grasp of the posterior lip steadying the cervix for this manipulation. The sutures of the anterior lip being tied are now used to hold down the cervix, while the posterior lip is being amputated and stitched. Sometimes bleeding from the cervix cannot be arrested by sutures, in which case forceps must be left on.

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[1] In amputating the cervix, Stiles' method may be used to tell whether we have cut through above the limits of the disease. A 5 per cent. solution of nitric acid is washed over the cut surface of the piece removed. This makes the carcinomatous tissue stand out opaque-white in contrast to normal fibrous tissue which becomes translucent.

[2] After Schroeder's method. Hofmeier (Zeits. f. Geb. u. Gyn., Bd. x., S. 269) reporting on 105 cases done in Schroeder's Clinique gives a mortality of 12·3 per cent. Of forty-seven cases fifteen were without recurrence two years after operation, and ten had not been heard of; after three years twelve were well, and after four years five. Lewers (Lond. Obstet. Trans., 1902, p. 221) has operated on 33 cases; eight were still alive, having survived the operation for periods varying from four to fifteen years. Seven out of these eight cases were squamous-celled cancer.

EXCISION OF THE WHOLE UTERUS.

Freund's Operation.

To Freund of Strassburg is due the credit of having first thought out and carried into execution a method by which the whole uterus could be removed. In 1878 he described his technique, which consisted in suturing the broad ligament in three portions, carrying the lower suture through the fornix by a long curved needle, introduced *per vaginam.* Otherwise the operation was done by the abdomen—an abdominal panhysterectomy. The mortality was so considerable[1] that the vaginal method was introduced with such satisfactory results that for a time it replaced the abdominal operation. The advantages of the vaginal route are that the seat of the disease being in the cervix, this is got at directly without having to go through the abdominal cavity and there is less shock to the patient. The drawback to the vaginal route is the limited space to work in, and the consequent difficulty in dealing with cases in which the disease has extended beyond the cervix. To give better access for the removal of lymphatic glands and the dissection of the ureter the abdominal operation has again been introduced, and various modifications of technique been brought forward by Ries,[2] Clark,[3] Rumpf,[4] Werder,[5] Mackenrodt,[6] and Franz.[7] A special feature is the placing of a bougie in the ureters, recommended by Pawlik and especially by Kelly, so as to allow of their being dissected out without injury; and the ligature of the uterine arteries near their origin. Further, to avoid infection of the peritoneum, the last stage of the operation (removal of the uterus) may be done *per vaginam*, making the operation an abdomino-vaginal one.

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[1] The results of this method of extirpation were according to Gusserow 148 cases with a mortality of 71·6 per cent., according to Duncan 137 cases with a mortality of 72 per cent.

[2] Ries: Zeits. f. Geb. u. Gyn., Band. xxxii., 1895, S. 266.

[3] Clark: John Hopkins Hosp. Bull., July 1895.

[4] Rumpf: Zeits. f. Geb. u. Gyn., 1895, Band. xxxiii., S. 212.

[5] Werder: Am. Jour. Obst., 1898, Vol. i., p. 289.

[6] Mackenrodt: Berlin Klin. Woch., 1902, No. 38.

[7] Franz: Brit. Gyn. Jour., 1903, p. 134.

We shall describe the vaginal operation first as it is the simpler and safer one. The abdominal one has a much higher mortality, and whether the results as to non-recurrence will be such as to compensate for this remains yet to be seen.

VAGINAL HYSTERECTOMY FOR CANCER.

Till recently the mortality was so great that it was doubtful whether removal of the uterus would ever take its place alongside of removal of the breast in cancer. By the vaginal operation, however, the mortality has been greatly reduced, and the results as to non-recurrence are as satisfactory as for mammary cancer, if not more so. The technique varies according as the ligature or clamp is used. We describe the latter operation first, as from its simplicity of technique, rapidity, and slight loss of blood it is preferable. Its drawback is the sloughing of tissue in the bite of the clamp, so that we have here to balance a more rapid operation against a more tardy convalescence.

Vaginal Hysterectomy with Clamp.

(*a*) *Vaginal hysterectomy with clamp.*—The use of the clamp to arrest hæmorrhage in vaginal hysterectomy was, we believe, first suggested by Spencer Wells.[1] But it was the French operators Péan and Richelot[2] who first carried it out successfully and elaborated the technique for its use. In Germany it has been strongly advocated by Abel,[3] and by Leopold and Theodor Landau.[4]

We shall describe the operation after Doyen's[5] method, which has given good results in our hands.

His technique differs from Péan's in that he omits the lateral splitting of the cervix, with the preliminary clamping of the base of the broad ligaments which this necessitated to control hæmorrhage; he has also emphasised the mesial splitting of the anterior uterine wall, as greatly favouring the descent of the fundus. The instruments required are bistoury and scissors, vaginal spatulæ—of the form shown in fig. 68

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[1] Ovarian Tumours: London, 1882, p. 526.

[2] Richelot had done up to August 1895, fifty-eight cases of hysterectomy for uterine cancer, with six deaths. Derniers résultats de l'hysteréctomie vaginale: Annal de Gyn., Dec. 1895.

[3] Seventy-nine cases reported on with four deaths.

[4] *See* their beautifully illustrated monograph "Die vaginal Radicaloperation, Tecknik und Geschichte." Hirschwald: Berlin, 1896. They have performed 438 vaginal hysterectomies—191 for inflammatory conditions, with a mortality of 2·6 p. c., and 247 for tumours (cancer, sarcoma, fibroid), with a mortality of about 6 p. c. (Macnaughton Jones on Gynecology in Berlin: Brit. Gyn. Jour., Feb. 1897.) Inasmuch as they emphasise the careful and complete removal of tissue. and the clamps are applied at the close of the operation, they call it the "enucleation method" rather than the "clamp method." This term is, however, equally applicable to Doyen's method. It is worth noting, however, that the clamps are not used in this operation as "preventive," to facilitate the cutting away of tissue without hæmorrhage, but as definite or consecutive—that is, as a permanent means of controlling it. They also draw attention to the fact that the clamps act as a drain, and do not interfere with the closure of the peritoneal cavity, which takes place by natural methods (without any sutures) above them.

[5] La Castration, totale par le vagin (Extr. des Archiv Prov. Chirurgie, Dec. 1892), where he reports on 112 operations (twenty-eight for fibroid, twenty-three for cancer, and sixty-one for other conditions) with six deaths.

(p. 113)—several strong volsellæ-like bullet-forceps, clamps of the pattern in fig. 258. The blades of the clamps are concave and elastic. From their concavity they come in contact first at the points, and only on firm compression of the handle, throughout. (Compare *b* and *d*). This device ensures compression of the tissue towards the end of the blade, which we shall see corresponds to the base of the broad ligament and uterine artery. Further, the blades are grooved on their inner aspect to near the point (fig. 258, *c*), producing a space into which the tissue bulges, which lessens the risk of the instrument slipping. A broad and a narrow-bladed clamp are required for each broad ligament; and it is better to have a few in reserve.

Doyen's Method of Vaginal Hysterectomy.

For a few days prior to the operation the vagina should be frequently douched and packed with some antiseptic gauze. Doyen recommends its distension for forty-eight hours with an air-bag.

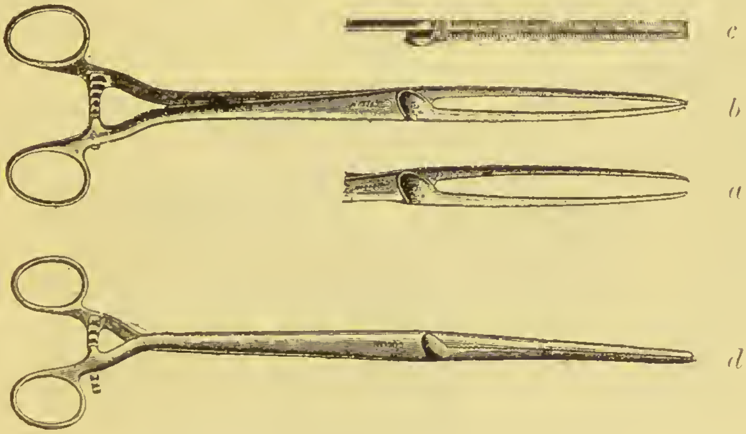


FIG. 258.

DOYEN'S CLAMP FOR VAGINAL HYSTERECTOMY.

c, Inner face of blade; *a*, Blades open; *b*, Closed; *d*, Compressed.

At the operation the patient is placed in the lithotomy posture, the external genitals shaved and thoroughly cleansed (as also the vagina) with soap and water and turpentine, and then douched with corrosive.

(1) The cervix is seized in two volsellæ, placed laterally and as high up as the fornix will allow; and a circular incision made with the scissors, no deeper than the vaginal mucous membrane, round the cervix (Pl. XII., fig. 1).

(2) The pouch of Douglas is opened into by alternately clipping and feeling with the index finger to tell when the peritoneal cavity is reached. When it is opened into, the incision is enlarged by guiding in the closed scissors and then opening them so as to tear the tissues apart. The finger now explores the posterior surface of the uterus, noting the presence of adhesions or sub-peritoneal fibroids. A small

swab with string attached is placed in the wound, and the cervix drawn backwards so as to expose the anterior fornix.

(3) The utero-vesical pouch is reached in the same way. Great care is needed in the separation of the bladder, which is effected by the finger rather than the scissors (Pl. XII., fig. 5). As soon as the supra-vaginal cervix is exposed, it is divided in the middle line anteriorly (Pl. XII., fig. 2); and the uterus drawn down by laying hold of it by the margins of the longitudinal section (Pl. XII., fig. 2). It is pulled down "hand over hand," as it were, a new grip being taken higher up with a fresh pair of forceps before the forceps with the lower grip are taken off (*see* fig. 3 in Pl. XII., in which the split anterior wall of the uterus is shown with the points of the succeeding forceps-bites).

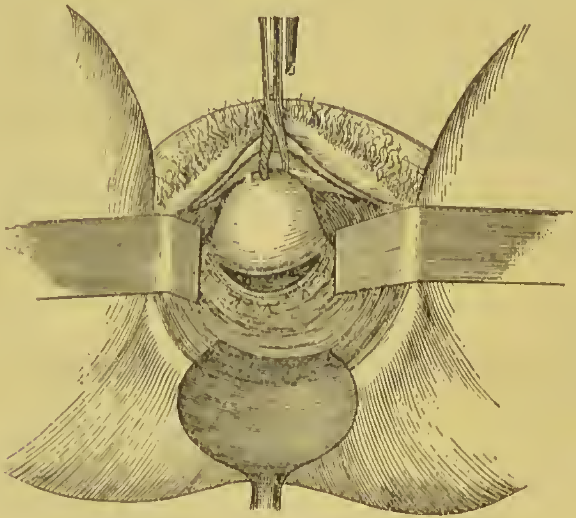


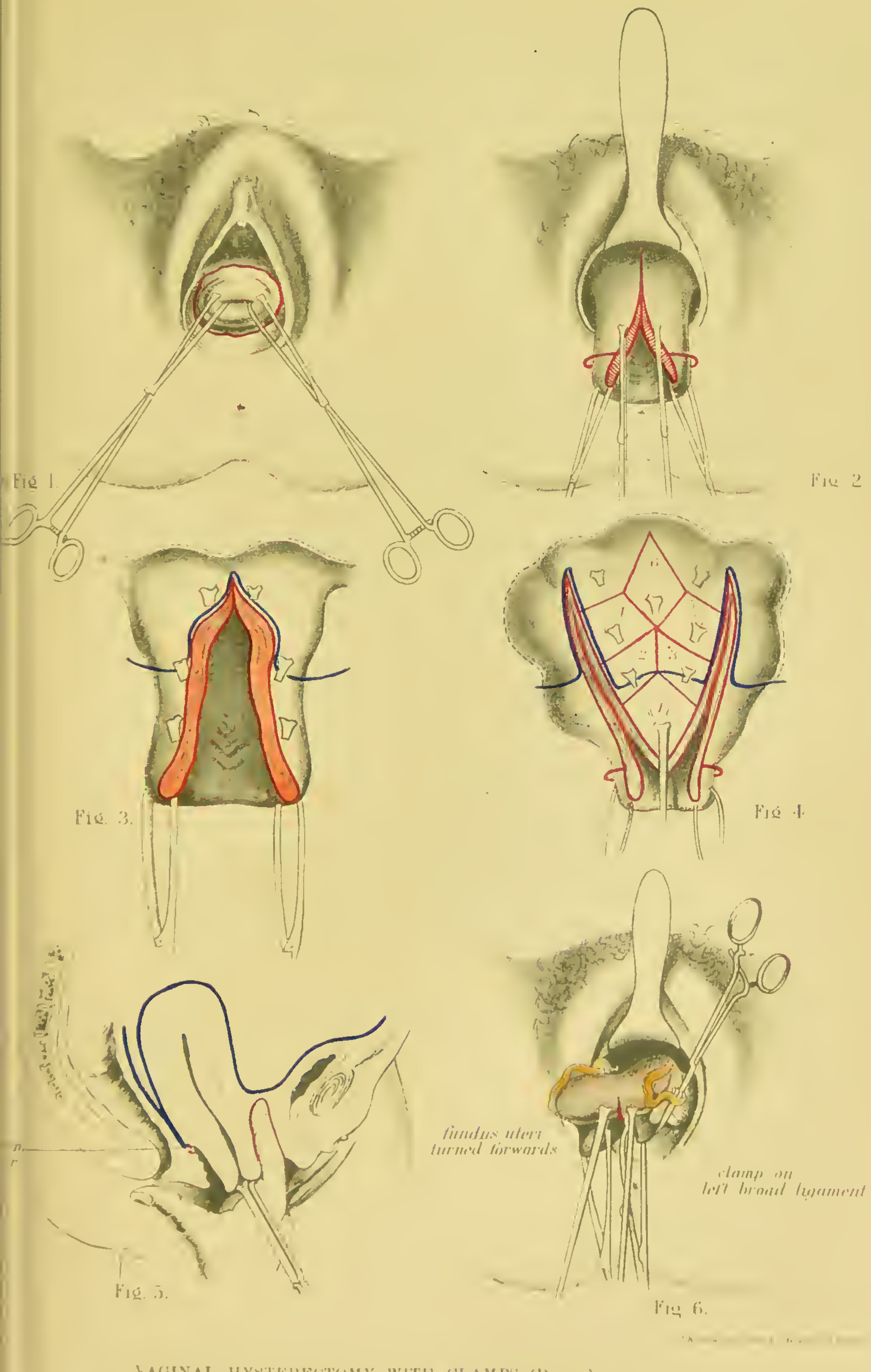
Fig. 259.

Vaginal Extirpation of the Uterus (*Martin*).

The cervix has been drawn down with forceps and the pouch of Douglas opened transversely.

Should the uterus be bulky with fibroid masses, a V-shaped incision may be made instead of a single mesial one, and the anterior wall cut out in small portions—1, 2, 3, 4, 5, 6 in Pl. XII., fig. 4. It is essential before cutting out the piece in the bite of the forceps to take a hold with another pair higher up—before cutting out 1, the forceps are placed on 2 and 3, and so on. The division of the anterior wall lets the uterus collapse and slip out. Fibroid masses in the wall may have to be enucleated and sub-mucous or sub-peritoneal tumours torn away to reduce the size of the uterus.

Instead of splitting the uterus and pulling it down by forceps, which may carry infective material from the diseased cervix, we may scoop out as much of the disease with the curette as possible, and then pass three ligatures through the cervix to shut off the infected area (*v.* fig.



VAGINAL HYSTERECTOMY WITH CLAMPS (Doyen).

Fig. 1. Incision in fornices. Fig. 2. Uterus drawn down and anterior wall divided . 3. Splitting of anterior wall; Fig. 4 shows the V-shaped incision. Fig. 5. Separation of bladder. Fig. 6. Application of clamp.

260), and use these also to draw the cervix down (Kelly). This is done before the incision is made in the fornix. In separating the bladder it is better to work with the sound in the bladder, so as to avoid injuring it.

(4) As soon as the fundus appears, it is grasped in forceps and flexed forwards so as to bring the upper margin of the broad ligament down. The left broad ligament is now taken between the index finger and thumb of the left hand (the index being passed (from above) over the upper margin of the ligament down its posterior aspect to its base until it touches the thumb, which has been slipped along its anterior aspect). A large clamp is guided underneath the finger and thumb, care being taken to feel that it grasps the whole ligament and includes nothing besides. It is then closed tight (Pl. XII., fig. 6). A second narrow pair of clamps is placed for safety between the first pair and the uterus, which is now cut away on that side. The right ligament is treated in the same way and the uterus cut away. The clamps are now brought down into the axis of the vagina, the broad ligaments

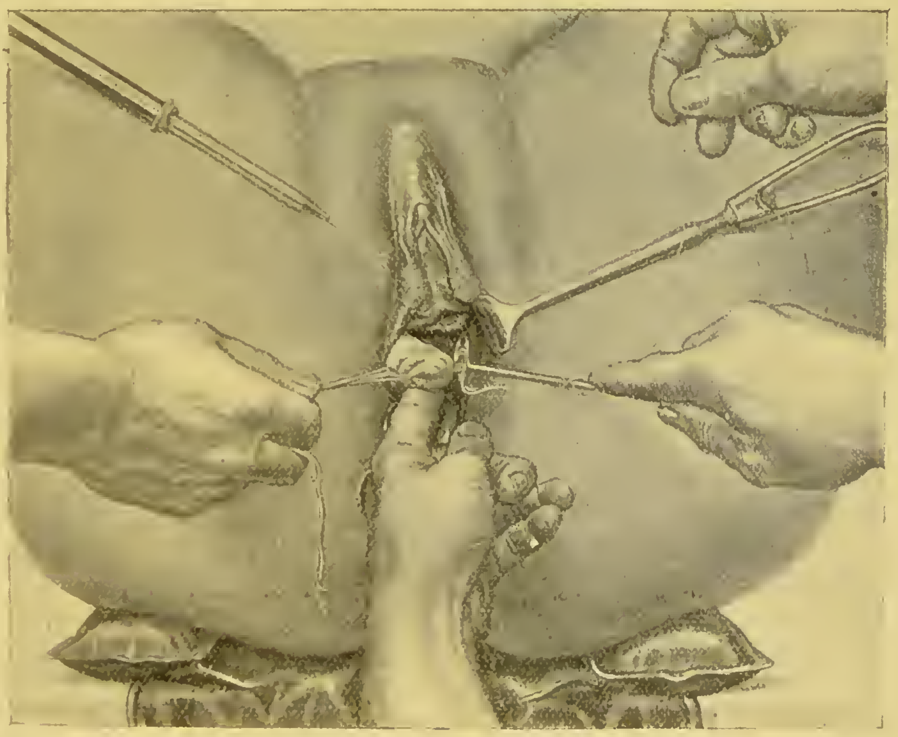


FIG. 260.

VAGINAL HYSTERECTOMY. The cervical canal has been closed up with three sutures, and the pouch of Douglas and the utero-vesical pouch cut into; the uterus is now being drawn over to the right side, and the ligature on the pedicle needle is being carried through the base of the left broad ligament (*Kelly*).

being thus twisted from their original direction in the axis of the brim to lie in the axis of the outlet.

(5) A gentle douche of weak boracic may now be given, and a tampon of gauze placed between the forceps and also round the handles to keep them from pressing injuriously on the vaginal wall. A turn of the gauze is passed round the two pairs of forceps on either side so as to keep them together.

After-treatment.—The urine is drawn off for forty-eight-hours to keep the tampon clean. There is sometimes considerable pain complained of till the clamps are removed, and morphia suppositories may be required. The large clamps are taken off in forty-eight hours, and the small ones some twelve hours later. In removing the clamps great care is necessary. The catch is first unfastened, the handles gently separated, and the clamp slid down with as little disturbance as possible. The gauze is removed a day later and a fresh pledget placed in the vagina, but not pushed up through the wound. No douche should be given for the first week, and even then with great care, the can only being raised high enough to allow a gentle stream. The patient keeps recumbent for three weeks, after which she may sit up a little, and leave her bed a week later.

Vaginal Hysterectomy with Ligature.

(*b*) *Vaginal hysterectomy with ligature.*—Different operators have introduced various modifications, but these are only in detail.[1]

The first stages in the operation are the same as if clamps are to be used. As much of the disease as possible is removed by the curette, the diseased area shut off by ligatures, which are used also for traction, and a circular incision made in the vaginal roof clear of the disease, and the peritoneal cavity opened into behind and in front.

In passing the ligatures through the broad ligament, a pedicle needle, such as that used for the ovarian pedicle (*v.* fig. 131), is required. The ligament is tied in sections from below upwards. The uterine artery, which is not reached till the second or third ligature, should be recognized by its pulsations before the ligature is passed round it. The cervix is drawn well over to the opposite side so as to bring the ligament within reach (fig. 260), and after the ligature is tied, the tissue between it and the uterus is divided with scissors. The tissue should be divided on the finger, to ensure that the scissors keep well clear of the ligature, and that only so much tissue as is included in it, is cut through. When the upper margin of the broad ligament is reached the finger can be hooked round it, and the last ligature passed round its free border. When the uterus is cut free on the one side it is easier to ligature the other side, which may be done from above downwards. All ligatures are left long, if silk be used.

It is important now to make sure that there are no bleeding points.

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[1] We follow mainly the operation performed by Kelly.

Traction on the ligatures will bring such into view, and they are controlled by fine sutures on a curved needle, which are cut short. The field of operation is carefully swabbed dry, and the vagina packed with gauze, which is left for two or three days, the urine being drawn off with a catheter to prevent the gauze from being soiled. No vaginal douching is required, but on removing the gauze packing a fresh one may be introduced. The patient keeps her bed for three or four weeks, during which time the ligatures come away; sometimes they are retained for several weeks.

ABDOMINAL HYSTERECTOMY FOR CANCER.

This operation is a panhysterectomy by a combined abdominal and vaginal method. After the removal of broken down carcinomatous tissue from the vagina by the curette and thermo-cautery, and the introduction of bougies into the ureters as may be thought necessary, the patient is prepared for the abdominal part of the operation, which is carried out on the same lines as hysterectomy for fibroids up to the ligature of the uterine vessels. These are tied farther out just where the uterine artery springs from the anterior division of the internal iliac (*v.* fig. 261). This allows of a fuller dissection of the ureter, and the removal of infected tissue from this situation, as well as of enlarged lymphatic glands. Kelly now removes the uterus from the abdomen by opening into the vaginal vault with a thermo-cautery, while Werder

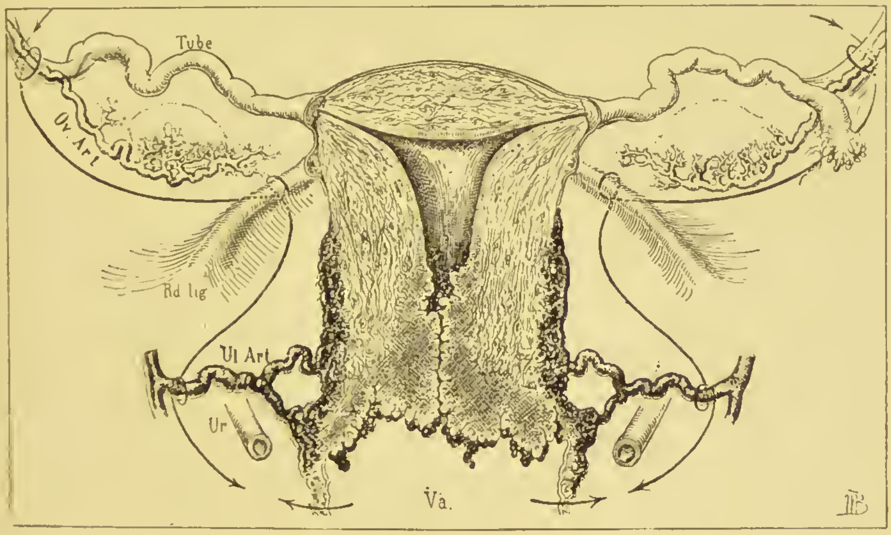

FIG. 261.

SCHEME SHOWING STEPS IN ABDOMINAL HYSTERECTOMY FOR CANCER. The uterus and vagina are cut away in the directions indicated by the arrows, following the black line. The loops indicate the positions of the three important ligatures on either side. *Ur.* is the ureter, outside of which the uterine artery is tied; the vagina is opened from below after the abdomen has been closed (*Kelly*).

has recommended the free dissection of the bladder and rectum from the roof of the vagina without opening into the latter; the uterus and vagina are then pushed down into the pelvic outlet, the peritoneal flaps united, and the abdomen closed. The uterus is then removed from below, the incision in the vaginal roof being made by the thermo-cautery.

Some advocate the separation of the uterus from the vagina to be done in the first instance from below, and then the operation completed by abdominal section.

Sacral Method of Hysterectomy.

Extirpation of the uterus has also been done by the sacral method, an operation which, though it allows a more thorough clearing out of diseased tissue and glands, will never compete with the vaginal operation. It was introduced by Hochenegg, who has collected ninety-eight cases with eighteen deaths—a mortality of 18 p. c.; he himself having done thirty with three deaths, a mortality of 10 p. c.[1]

RESULTS OF HYSTERECTOMY FOR CANCER.

Statistics as to mortality can only be drawn from the record of a large number of cases, and different operators have met with varying success. Purcell, who did the first vaginal hysterectomy for cancer in England, the patient being alive twelve years after the operation, had sixty-five operations with twelve deaths while Jessett[2] recorded seventy cases with six deaths. In an interesting paper read before the British Medical Association in 1902, Sinclair[3] gives statistics showing a mortality for vaginal hysterectomy ranging from 3·4 to 10 p.c. The results have been so encouraging that a greater number of cases are operated on now than formerly. The abdominal operation contrasts very unfavourably as regards its mortality with the vaginal one. Franz has collected statistics of 273 operations with 54 deaths, or a mortality of 23·3 p. c.

As regards the non-recurrence of the disease the results of the vaginal operation are such as to warrant its being undertaken in all cases in which the disease is still limited to the uterus. Here again the results of the different operators vary widely, but we may say that from one-fourth to one-third of the cases operated on are without return of the disease five years after the operation. Thus Lewers found 27·5 p. c. of his forty cases without recurrence after two to seven years; Kelly 28 p. c. after three to six years; Cullen 20 p. c. in seventy-three cases; Olshausen 30 p. c.; and Schaute 36·7. The results are still better, as we shall see, for hysterectomy for cancer of the body of the uterus.

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[1] Quoted by Buechler: Zeits. f. Geb. u. Gyn., 1894, Bd. xxx., Hft. 2, S. 394.

[2] The early diagnosis of malignant disease of the body of the uterus: Brit. Gyn. Jour., 1896-7, p. 327. Purcell's results are given in the discussion.

[3] Loc. cit. Von Ott for 1000 operations in Russia, 10 p. c.; Lewers, 7 p. c.; Kaltenburg and Fehling, 6·6 p. c.; Chrobak, 5·6 p. c.; Mangiagalli, 8·6 p. c.; Zweifel, 5·4 p. c.; Olshausen, 3·4 p. c.

Similar statistics as to the results of the abdominal operation are not attainable, and we may say that while, from the standpoint of the operator, the abdominal may seem the more satisfactory method, it will not compete with the vaginal unless the mortality can be materially reduced.

Supra-vaginal amputation of the cervix used to be preferred in suitable cases to hysterectomy, as being a minor operation; but now that the major one has become a relatively safe one, it is displacing it.

Metastasis and Recurrence.

Metastasis and Recurrence after Operation.—Considerable attention is being directed to this subject at present from its important bearing on operative treatment. The unsatisfactoriness of operations for cancer of the uterus, as for cancer elsewhere, lies in the liability to the reappearance of the disease; and many question the justifiability of subjecting a patient to such a grave operation as extirpation of the uterus unless more satisfactory results as to non-recurrence, for at least a reasonable time, can be obtained. Hence the importance of inquiry as to the frequency of the reappearance of cancer after operation.

The type and seat of the morbid process have both a bearing on this. Thus recurrence is less frequent after epithelioma than after adeno-carcinoma. Further, there is more immunity after operation in superficial cancer of the vaginal portion and cancer of the body of the uterus (whatever form the cancer takes) than in ordinary cancer of the cervix. In the first case it may be due in part to the type (epithelioma being more frequent there), but it is also due to a less rapid invasion of the lymphatics, which is the chief cause in the latter case (see p. 478).

Local recurrence may be accounted for in three ways: (1) by incomplete removal—cancer cells being left in the lymphatics of apparently healthy tissue; (2) by unclean operation—cancer cells being inoculated on the raw surfaces during the operation; and (3) by reappearance of the disease from the same cause which originally produced it; further, there may be metastasis in remote organs. The rapidity of the return suggests that it is due to one of the first two causes. The second of these has been emphasised by Winter and Mackenrodt; and has this to be said for it, that in operating for cancer of the cervix the operator is often working in a hole with broken-down carcinomatous debris. Hence the operation is not clean, like the excision of a non-ulcerating breast. Further, the peritoneum, which is peculiarly susceptible to implantation with malignant cells, is also exposed. To diminish the risk, Winter recommends removal of as much of the broken-down tissue as possible before extirpating, and the cleansing of the field with an alcoholic solution of corrosive sublimate.

As regards the involvement of the pelvic lymphatics in cancer of the uterus, there is considerable difference of opinion. While Ries[1] from the examination of a large number of sections, concludes that invasion of the lymphatics takes place as early and as frequently in the case of cancer of the uterus as in that of other organs, von Franque[2] maintains that cancer of the cervix does not advance along the lymph channels so much as by a continuous spreading, the pelvic glands not being infected till late.

CANCER AND PREGNANCY.

The association of cancer with pregnancy is extremely rare, and concerns the obstetrician rather than the gynecologist. Winckel found that it occurred only eight times out of 15,000 labours, while Stratz in 17,000 cases of pregnancy and labour found it five times complicating the former and seven times the latter. If recognised before the fourth month the whole uterus should be removed by pan-hysterectomy,[3] in the later months the question of waiting till the child is viable has to be considered.

Sarvey[4] gives tables showing the results of the various methods of operative treatment. Vaginal extirpation was performed during the first four months twenty-nine times with no deaths. During the later months, nineteen cases have been recorded. Of these eight were treated by abdominal extirpation, with one death; five by supra-vaginal amputation of the uterus, followed by removal of carcinomatous cervix per vaginam, with one death; and in five cases, after the removal of the fœtus through an incision made per vaginam in the uterine wall (Vaginal Caesarean Section of Dührssen), the uterus was extirpated per vaginam, all recovering. He also gives eleven cases, in which, after the induction of labour, the uterus was removed per vaginam.

[1] Am. Jour. Obst., 1903, Vol. ii., p. 510.

[2] Zeits. f. Geb. u. Gyn., Band xliv., S. 173.

[3] Cumston on the Surgical Aspects of Carcinoma Uteri, Complicating Pregnancy, Labour, and the Puerperium: Am. Jour. Obst., 1902, Vol. i., p. 1. He has collected from the literature seventeen cases of total abdominal hysterectomy during the sixth or seventh month with five deaths.

[4] Carcinom und Schwangerschaft: Veit's Handbuch d. Gyn., Bergmann, Wiesbaden, 1899.

CHAPTER XLIII.

CARCINOMA UTERI (OF BODY): DECIDUOMA MALIGNUM.

LITERATURE.

Breisky and Eppinger—Prager med. Wochenschrift, S. 78, 1877. *Cullen*—Cancer of the Uterus: London, Henry Kimpton, 1900. *Gusserow*—Neubildungen des Uterus, S. 254: Stuttgart, 1855. *Hofmeier*—Zur Anatomie und Therapie des Carcinoma Corporis Uteri: Zeitsch. f. Geb. u. Gyn., Bd. xxxii. *Schroeder*—Die Krankheiten der weiblichen Geschlechtsorgane, S. 295. *Simpson, Sir J. Y.*—Selected Obstetrical and Gynecological Memoirs, edited by Watt Black, p. 769. *Veit*—Zeitschrift für Geburts. und Gyn., Bd. i., S. 467. Zur Kenntniss des Carcinoma Corporis Uteri: Centralb. f. Gyn., Bd. x., S. 173. *Winter*—Die Bösartigen Neubildung des Uterus, Veit's Handbuch: Bergmann, Wiesbaden, 1899. *See* also literature of Chaps. XL. and XLII.

PATHOLOGY AND ETIOLOGY.

Carcinoma affects the body of the uterus much more rarely than the cervix; in only 13 out of 686 cases of uterine cancer, that is in rather less than 2 per cent., was the disease situated in the body of the uterus (*Schroeder*).

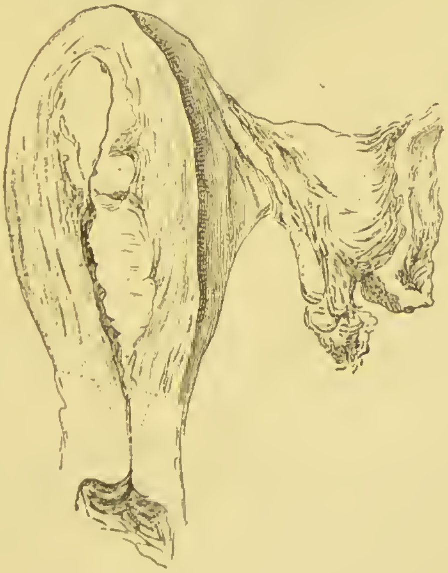

Fig. 262.

Uterus extirpated for Cancer; no recurrence five years after operation (*Hofmeier*).

As to the naked eye appearances, it shows itself either as a diffuse affection of the whole mucosa or as localised nodules (fig. 262); of these the latter is the more frequent form.

The starting point of the new growth is either the epithelium of the surface of the mucosa or that of the glands. According to Winter, when it begins in the surface epithelium the cylindrical cells first of all lose their cilia, become shorter and cubical and are arranged in several layers, resembling squamous epithelium. From this plugs descend into the cellular tissue as in epithelioma of the cervix, and cell-nests may be produced. One form closely resembles ordinary epithelioma, and has been called "keratinising carcinoma" of the body[1] When it arises in the glands the first change, according to Leopold, consists in the projection into the lumen of delicate processes of stroma, covered with epithelium, on the apex of which the proliferation of epithelium is most marked.

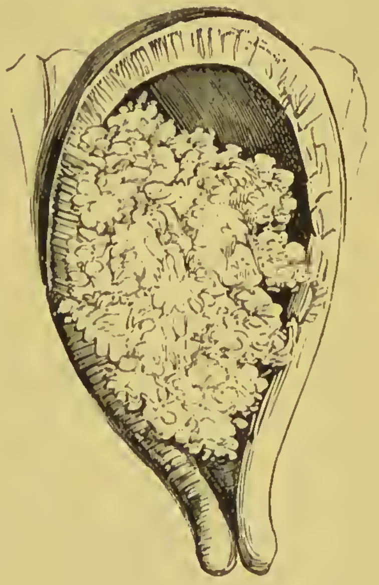

FIG. 263.

CARCINOMA OF THE BODY OF THE UTERUS. The uterine cavity is increased in size, but the cervix is undilated (*Sir J. Y. Simpson*).

Cullen's description of the changes in the surface epithelium is somewhat different. "There is a distinct and progressively increasing proliferation of the surface epithelium, beginning with small outgrowths consisting of a few cells; we next have a larger growth containing stroma, which shows marked branching, and finally, an excessive proliferation of the epithelium with the formation of many new glands." In the glands themselves, we note an increase in their size and the formation of many layers of cells.

[1] See a case recently recorded by Lewers: Lond. Obst. Trans., 1903, p. 79.

As to *Etiology*, what has been said of carcinoma of the cervix applies here with two additional facts: (1) It occurs rather later in life than cancer of the cervix; and (2) is more frequent in nulliparæ.[1]

SYMPTOMS AND DIAGNOSIS.

Pain.

Hæmorrhage.

Discharge

Again, as in carcinoma of the cervix, the symptoms are pain, hæmorrhage, and fœtid discharge. 1. *Pain*, in contrast with carcinoma of the cervix, is always an early symptom. Sir J. Y. Simpson drew attention to periodic attacks of severe pain as characteristic of cancer of the body. This is not always present and is probably due to uterine contractions set up by accumulation of secretion (*Veit*). 2. *Hæmorrhage* is also present at an early stage. It may occur between the periods, or take the form of profuse menorrhagia, because the mucous membrane from which the menstrual flow takes place is diseased. After the climacteric irregular bleeding takes place from the new growth. 3. *The discharge* is usually profuse and becomes after a time fœtid. Sometimes it is watery and not offensive; rarely is it altogether absent.

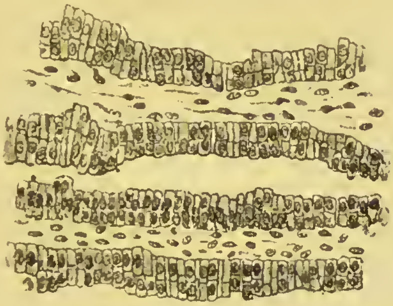

Fig. 264.

Commencing Cancer of the Body of the Uterus (*Barbour*). Note the multiplication of the epithelium lining the gland spaces.

On vaginal examination, the cervix is found to be either normal (fig. 263) or dilated. The uterus is enlarged, and may be freely movable or may be fixed by adhesions. The sound shows the cavity to be enlarged and may reveal irregularity of the mucous membrane; its introduction is followed by hæmorrhage. The condition of the mucous membrane is more precisely ascertained by examination *with the finger after dilatation of the cervix* with a tent. In the majority of cases, certainty of diagnosis is possible only through *microscopic examination* of fragments removed by the curette. Should these show merely hypertrophied glands, we must remember that this is sometimes a transition stage to malignant disease. Fig. 264 shows a microscopic section of tissue removed by the curette from the uterus of a patient who declined further operation, and died within eighteen months of cancer of the body of the uterus. It is of interest as showing the first stage of cancer beginning in the glands, when no change except multiplication of the epithelium is recognisable, typical carcinomatous cells not yet being present.

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[1] Taking Veit's two series of cases together, we have out of 80 cases, 31 between 50 and 60, and 21 above 60 years of age (*cf.* table in fig. 251); and of 72 cases, 38 were childless.

The *Differential Diagnosis* must be made from—

Portions of retained placenta,
Sloughing submucous-fibroid,
Hæmorrhagic endometritis,
Deciduoma malignum.

During the period of sexual activity, differential diagnosis is often difficult, and can be made only by exploring the uterus with the finger, and microscopic examination of the tissue removed. After the menopause, the recurrence of hæmorrhage is an important diagnostic. The microscope is, when available, the most reliable guide.

TREATMENT.

As to the treatment of the symptoms, this is the same as in Carcinoma of the Cervix (*v.* Chap. XLII.). As to the treatment of the disease, the scraping away of the polypoidal masses with the curette or sharp spoon gives temporary relief from the hæmorrhage and discharge. The only hope of cure lies in extirpation of the uterus (*v.* p. 503). The results of hysterectomy are better, as regards non-recurrence, for cancer of the body than for that of the cervix, 56 p. c. of the former being without recurrence as against 20 p. c. of the latter (*Cullen*).

Adenoma Malignum.—It is doubtful whether malignant adenoma should be considered as an affection distinct from carcinoma of the uterus.[1] It usually affects the body of the uterus; being, unlike carcinoma, rare in the cervix.[2] Its clinical history closely resembles the latter, and the pathological appearances are not clearly marked off —adenoma passing into carcinoma. There is an atypical hypertrophy, the lumina of the glands becoming enlarged, irregular, and often communicating with each other. The columnar epithelium loses its cilia and becomes stratified, and the gland may be converted into an epithelial plug. It occurs late in life, begins insidiously, and runs a chronic course. While hæmorrhage is present, there is not the fœtid discharge so characteristic of cancer. Cases have been described by Matthews Duncan[3] and more recently by Länderer,[4] Beyea,[5] and Sinclair.[6]

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[1] At the discussion on this subject before the Berlin Gynecological Society opinions were divided; while Hofmeier advocated the distinction, Leopold maintained that the term adenoma can mean only a benign glandular formation; as soon as the glandular development is atypical, it ceases to be an adenoma. Cent. f. Gyn., 1891, S. 438-440.

[2] Gebhard could collect only 6 cases in which the cervix was affected: Zeits. f. Geb. u. Gyn., Bd. xxxiii., Hft. 3. Other cases have been recorded by Krukenberg (Monats. f. Geb. u. Gyn., 1897, Bd. 5, S. 138) and Cullen (Cancer of the Uterus, p. 304).

[3] Quoted by Williams, *op. cit.*, p. 100.

[4] Eine Adeno-carcinom des Corpus Uteri: Zeits. f. Geb. u. Gyn., Bd. xxv., 1892.

[5] Malignant Adenoma of the Corpus Uteri: Amer. Jour. Obstet., Vol. xxxiii., 1896, p. 196.

[6] Loc. cit.

DECIDUOMA MALIGNUM (CHORIO-EPITHELIOMA).

Literature—*Bacon*—A Case of Deciduoma Malignum : Amer. Jour. Obstet., 1895, p. 679. *Cazin*—Des déciduomes malins : La Gynécologie, 1896, p. 15. *Chiari*—Ueber drei Fälle von primärem Carcinom im Fundus und Corpus des Uterus : Wien Med. Jahrb., vii., 1877. *Croom, Sir Halliday*—On the Clinical Features and post-mortem Appearances of a Case of Deciduoma Malignum : Brit. Gyn. Jour., 1902-03, p. 59. *Eden*—Deciduoma Malignum, a Criticism : Lond. Obstet. Trans., 1896, p. 149. *Freund*—Ueber bösartige Tumoren der Chorionzotten : Zeits. f. Geb. u. Gyn., 1896 xxxiv., Hft. 2. *Gottschalk*—Das Sarcom der Chorionzotten : Archiv f. Gyn., Bd. xlvi., S. 1, and Ueber das Sarcoma chorion-deciduo-cellulare (Deciduoma Malignum) : Berlin klin. Woch., 1893. S. 87 and 116, and Archiv f. Gyn., li., S. 56. *Haultain*—Deciduoma Malignum, A Critical Review of a Case successfully treated by Vaginal Hysterectomy : Brit. Gyn. Jour., 1899-1900, p. 190. *Ladinski*—Deciduoma Malignum, A Clinical Review : Am. Jour. Obst., 1902, p. 465. *Lewers*—A Case of Primary Sarcoma of the Body of the Uterus, etc. : Lond. Obst. Trans., 1897, p. 246. *Lockyer*—A Case of Chorio-epithelioma with Pulmonary Metastases : Lond. Obst. Trans., 1902, p. 24. *Mackenna*—Malignant Degeneration of the Villi of the Chorion, Syncytioma Malignum : Edin. Med. Jour., 1901, p. 422. *Maier, R.*—Ueber Geschwulstebildungen mit dem Bau des Decidualgewebe : Virchow's Archives, Bd. lxvii., S. 65. *Marchand*—Monats. f. Geb. u. Gyn., 1895, Bd. i., S. 513. *Menge*—Ueber Deciduosarcoma Uteri : Zeits. f. Geb. u. Gyn., xxx., Hft. 2, S. 323. *Nové-Josserand and Lacroix*—Sur le déciduome malin : Annal. de Gyn., et d'Obst., tome xli., Fev. et Mar., 1894. *Pestalozza*—Contributo allo Studio dei Sarcome dell' Utero : Il Morgani, Sept. 1891. Di un raro esito remoto della mola vesicolare : Il Morgani, Oct. 1891. Sarcoma deciduo-cellulare : Annal. di Obstet. et Gyn., Nov. 1895, and Cent. f. Gyn., 1896, S. 175. *Pierce*—Chorio-epithelioma Malignum : Am. Jour. Obst., 1902, Vol. i., p. 221. *Polano*—Uber das Verhalten der Uterusschleimhaut nach Abort und Blasenmole : Zeits. f. Geb. u. Gyn., Band. xli., also Samm. Klin. Vort. n. F., No. 329. *Sänger*—Zwei aussergewöhnliche Fälle von Abortus : Cent. f. Gyn., 1889, S. 132, and Ueber Sarcoma Uteri deciduo-cellulare, etc. : Archiv f. Gyn., xliv., 1893, S. 89. Ueber Deciduoma : Verhandlungen der Deutschen Gesell. f. Gyn., Bd. iv., S. 333. *Spencer*—A Case of Deciduoma Malignum : Lond. Obst. Trans., 1896, p. 135. Quarterly Jour. of Med., July 1896. *Whitridge Williams*—Johns Hopkins' Hospital Reports, Vol. iv., No. 8, and Amer. Jour. Obstet., 1895, p. 319.

In our last edition we gave a complete bibliography of the cases recorded up to 1896. They are too numerous now for this to be continued. The above literature comprises only the more important papers and some of the more recent ones. Ladinski's paper gives a complete bibliography of the cases recorded up to 1902.

In 1889 Sänger drew attention to a malignant affection of the uterus developing in the puerperium, to which he gave the name of *deciduoma malignum* from its resemblance to decidua in structure. Subsequently he called it *sarcoma deciduo-cellulare* because clinically it resembles sarcoma, while its pathological structure, according to him, reproduced only the cells of the decidua, not the other elements. Though the clinical features of this affection are so well marked as to give rise to little discussion, there has been much controversy as to its pathological nature, etiology, and nomenclature.

In our last edition we placed deciduoma provisionally alongside of sarcoma. While there is still difference of opinion as to its nature there is no doubt that proliferation of the epithelium of the chorionic villi is an important characteristic in most of the specimens described, so that a large proportion of the cases are therefore carcinoma of the chorion. The relation of the tumour to hydatid mole, which is undoubtedly an affection of the epithelium of the villus also supports this view: for this reason we have transferred deciduoma malignum to the chapter on carcinoma of the body of the uterus. We must bear in mind the possibility that more than one form of tumour has been described, that some specimens may be chorio-epithelioma and others decidual sarcoma.

While the pathology of the disease is still under dispute, its clinical features are well marked, and in discussing this subject we shall depart from our usual method of study, and consider first the clinical features and then the pathology and etiology, including under the latter the questions of origin and nomenclature.

A study of 132 cases recorded[1] brings out the following facts.

Clinical Features of Deciduoma Malignum.

The *age* of the patients ranges from seventeen to fifty-five, the *mean being thirty-two.* This disease is not therefore like cancer, an affection of advanced life; and for reasons to be mentioned immediately it necessarily arises within the child-bearing period.

Commencement.

It will be noted that the affection has always developed *shortly after pregnancy*—in this respect it differs from sarcoma or carcinoma, as we ordinarily understand these; but it is an open question whether we may not be dealing with these affections modified by recent pregnancy, rather than with an entirely new pathological condition.

While it may arise after a normal full-time pregnancy, there seems to be a special tendency to it after a *hydatid mole*: fifty-one cases or 40°/₀ give a history of this. In many cases it has followed on abortion, so that in its commencement it has often been mistaken for the retained products of an abortion.

Symptoms.

The *first symptom* has in almost every case been *hæmorrhage*, which began as early as six days, and as late as twenty-one months after delivery, the usual period being from four to six weeks. Exceptionally, the development of a tumour in the labium, vestibule, or vagina was the first thing to attract notice. The hæmorrhage was often followed by foul-smelling discharge and fever, which increased the resemblance of the case to one of "retained products of conception."

Diagnosis.

While in the earlier cases, mistaken diagnosis was frequent, in the later ones the correct *diagnosis* was usually made — most frequently *from microscopic examination* of the tissue removed by the curette. The uterus was found larger on bimanual examination than it should be, and sometimes rapidly increasing in size. Its contents, while friable and vascular were of the nature of a soft tumour growing in the walls, sometimes distinctly polypoidal, and not the loose débris and blood-clot found in cases of retained products of abortion.

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[1] In Ladinski's paper to which we are much indebted.

Metastasis.

The *metastases* are the most striking feature. Most frequently these have occurred in the lungs, due to diffusion through the blood vessels. The next and most frequent situation is the vagina,[1] while they are also found in the liver, spleen, ovaries, and other organs.[2]

Duration.

The *duration* of the disease is *short*, death occurring about six months after the delivery;[3] the most rapid course was two months, and the most protracted three-and-a-quarter years, but the mean duration of life was under six months. When we consider that there is no evidence of the pathological condition having existed during the pregnancy, this is a very short time for a malignant condition to develop and to run its course. This disease, whatever its nature, is apparently more malignant than cancer or sarcoma, as we ordinarily understand these.[4]

Treatment.

The only successful *treatment* has been *hysterectomy before metastases* have developed. Curetting may be necessary for diagnosis, but cannot be considered as a form of treatment, the effect being at most only temporarily beneficial, and sometimes prejudicial by exciting new infection. Of fifty-three cases in which hysterectomy was done, fifty recovered from the operation, though we have not data for saying how many of these may be considered as permanent cures. Since, however, the disease has been recognised in its early stages and promptly dealt with, the mortality has been reduced from $73^{\circ}/_{\circ}$ to $59^{\circ}/_{\circ}$. Hence the great importance of examining thoroughly cases of uterine hæmorrhage, especially after hydatid mole, so that the condition may be early recognised.

Metastases are not a contra-indication to operation, as these have disappeared after the uterine tumour was removed.

PATHOLOGY.

The naked-eye changes in the uterus are well defined, and will be evident from fig. 265.[5] Spencer describes the uterus as enlarged (4½ inches long and 2½ inches broad); and when laid open, showing a gangrenous cavity nearly perforating the fundus, due to the breaking down of the tumour. There were secondary growths in the cervix and lungs. A microscopic section (fig. 266) shows that the tumour consists of "isolated multinucleated masses of large cells (the so-called

Microscopic Structure of Deciduoma Malignum.

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[1] A case of chorio-epithelioma has been described in the vagina. Two vaginal tumours were removed after an abortion of a hydatid mole, the uterus being apparently perfectly healthy. Schmidt: Cent. f. Gyn., 1900, p. 47.

[2] The frequency of metastases is thus given by Ladinski: lungs, 47; vagina, 40; liver, 13; spleen, 13; kidneys, 13; ovaries, 10; intestines, 8; brain, 7; broad ligaments, 5; pleura, 4; mesenteric glands, 3; pancreas, 2; heart, 1; stomach, 1; pelvic glands, 1.

[3] After mole in six months; abortion, five months; labour, four months.

[4] Of the 124 cases, 51 recovered and 73 died, giving a mortality of $53^{\circ}/_{\circ}$. The cause of death was most frequently metastases in some other organ, sometimes hæmorrhage and exhaustion.

[5] Reproduced here from the London Obstetrical Transactions, by the kind permission of Dr Spencer and the Council of the London Obstetrical Society. This preparation has the special interest of being from the first recorded case of deciduoma malignum in England.

'syncytium'), and of a loose tissue between the syncytial masses containing individual cells similar to those of the syncytium; in this tissue haemorrhages, and in places, aggregations of leucocytes, are seen The syncytium is often extensively vacuolated. The growth is penetrating into the muscular wall.

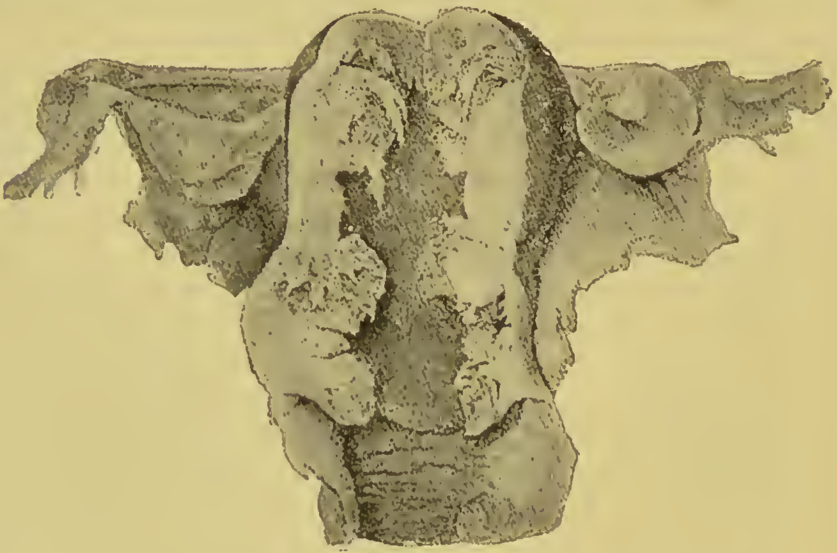

Fig. 265.

Uterus from a Case of Deciduoma Malignum (*Spencer*).

"Under a high power (one-sixth) the syncytium, which in places has the appearance of a huge multinucleated cell, is evidently made up of a number of large cells aggregated or fused together. . . . The loose tissue between the syncytial masses is a delicate reticulum of connective

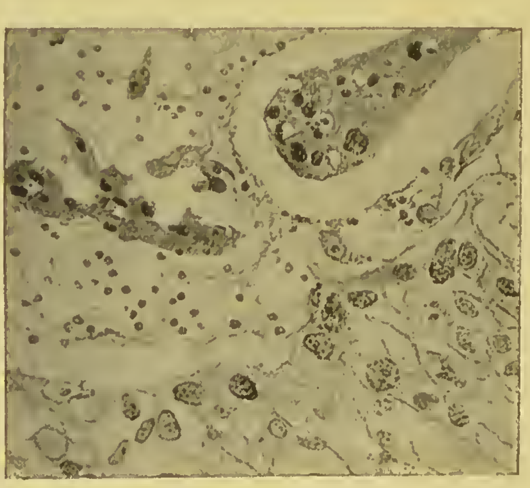

Fig. 266.

Section of Tumour from Uterus in Fig. 265 (*Spencer*).

tissue, in the meshes of which are large cells similar to those making up the syncytium."

In Haultain's case there was a small sessile growth the size of a walnut, springing from the anterior wall of the uterus. It was covered with apparently healthy mucosa, with the exception of a small portion from which there protruded blood-clot; the rest of the mucosa was apparently healthy. Microscopic examination showed the cellular elements of two types: "(1) large polyhedral cells which stain lightly, and whose large nuclei show a wide internuclear network; (2) multinucleated, deeply staining protoplasmic masses of all varieties of shape, whose nuclei are extremely rich in chromatin, and show no wide internuclear network as in the other cells . . . nowhere is there evidence of intercellular substance or blood vessels, although free blood is intimately mixed with the cells, and is also found in the vacuoles in their substance (fig. 267)."

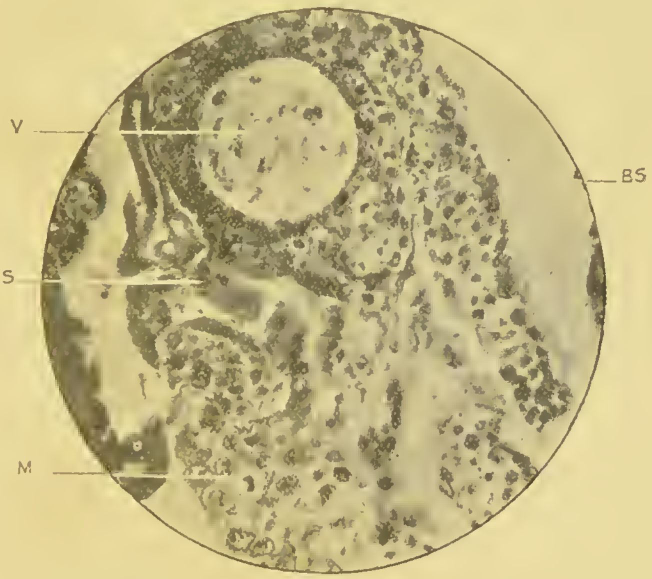

FIG. 267.

Transverse section of chorionic villus in tumour, showing intense proliferation of both layers of epithelium. (V) Villus. (S) Protoplasmic masses of syncytium. (M) Individual cells showing mitosis. (BS) Blood space (*Haultain*).

These two kinds of cells have been noted by most observers, the proportion of them varying both in the original tumour and in metastases. While most observers now believe the polyhedral decidual-like cells to be derived from Langhan's layer, Sänger held that they had their origin in the decidua, and finding them predominating described the disease as a sarcoma with cells of decidual type. Gottschalk found both elements in the tumour but epithelial masses alone in the metastasis, while Freund described his case as consisting of syncytium alone.

Changes in the ovary in cases of hydatid mole and deciduoma have been described by Marchand, Stoeckel, and Runge. Runge[1] has examined the ovaries from eight cases, and refers to twenty-four others in the literature, in which the ovaries were described as cystic. Round the wall of the cyst, in his specimens, was a layer of cells containing yellowish elements resembling the lutein cells, which form the yellowish band lining the corpus luteum. What the relation is between these cysts and deciduoma has not yet been determined, but the ovaries should be carefully examined in all cases.

ORIGIN AND NOMENCLATURE.

A glance at fig. 268 will recall to the student the histological structures found at the placental site. In the diagram we have given some of the names proposed for this tumour according to the view taken of its genesis.

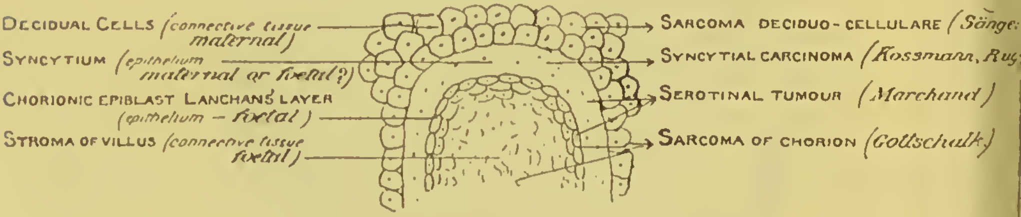
DECIDUAL CELLS (connective tissue maternal)
SYNCYTIUM (epithelium maternal or foetal(?))
CHORIONIC EPIBLAST LANGHANS' LAYER (epithelium – foetal)
STROMA OF VILLUS (connective tissue foetal)
SARCOMA DECIDUO-CELLULARE (Sänge
SYNCYTIAL CARCINOMA (Kossmann, Ru
SEROTINAL TUMOUR (Marchand)
SARCOMA OF CHORION (Gottschalk)

FIG. 268.

HISTOLOGICAL STRUCTURES found at placental sites which have suggested the NOMENCLATURE of Deciduoma Malignum.

The clinical resemblance of this tumour to sarcoma was a strong argument for Sänger's position that it was developed *from the maternal connective tissue*—that is to say, *the decidual cells.* He called it a sarcoma deciduo-cellulare, regarding it as a sarcoma developed from the products of conception. Others hold that it is an ordinary sarcoma modified by pregnancy. Thus Snow[2] maintains that the extension of the local lesion and the distribution of the metastases is not consistent with the view that the disease developes after parturition; it must have been present during pregnancy. Further, the histological appearances are such as are found in rapidly-growing sarcomata.[3] The development of deciduoma without any reference to a recent pregnancy favours the view that it is a sarcoma.[1]

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[1] Ueber die Veränderungen der Ovarien bei syncytialen Tumoren und Blasenmole: Arch. f. Gyn., Vol. lxix., p. 33.

[2] Is there any real Deciduoma Malignum?: Brit. Gyn. Jour. 1902, p. 163. And this was the view maintained by Bland Sutton, Eden, and others when the subject was discussed at the London Obstetrical Society in 1896.

[3] A tumour similar to chorio-epithelioma has been described in the testicle as an embryoma containing malignant degeneration of chorionic epithelium. Steinhaus: Wien. Med. Woch., 1902, No. 17.

The source of the syncytium, or nucleated layer of protoplasm surrounding the villi, is disputed, some maintaining that it is maternal, as in the dog, cat, and mouse; others that it is fœtal. Whether it be fœtal or maternal it is *epithelial*, and if this tumour arise from this source it is a *carcinoma*. Hence the term "syncytial carcinoma."

Beneath the syncytium is another layer of epithelial cells, which is either a specialised layer of the latter or the proper chorionic epiblast, according to the view we take of the syncytium. It seems probable that the round-celled element of this tumour arises from this layer (which is called Langhan's layer, to distinguish it from the syncytium layer), while the masses of nucleated protoplasm arise from the syncytial. If this, which is the view of Marchand, be the case, the term choriocarcinoma is better than syncytial carcinoma; but in the present state of our knowledge it is best to retain the term first proposed by Sänger—deciduoma malignum.

This term commits us to no definite view as to its pathology. After careful analysis of all the cases described, Veit inclines to the view that we are dealing with a disease by itself, more allied to sarcoma than carcinoma. He does not regard syncytium as a specific tissue, and found only in chorionic villi, but a transition stage either in the development or in the retrogression of separate cells; also that the varying appearances of syncytium found in deciduoma make it impossible for us to assume that they have all had the same origin. It may yet be found that under the term deciduoma different varieties of tumours have been described, which will explain the wide divergence of view as to its nature.

The relation of deciduoma malignum to hydatid mole is of special interest. Hydatid mole has been shown by Marchand not to be a myxoma of the chorion, as Virchow believed, but a proliferation of the fœtal ectoderm (syncytium and Langhans' cells), accompanied by œdema of the stroma. In normal pregnancy the villi penetrate to some extent the fibrinous layers surrounding them, but the penetrating cells soon perish; while in the case of hydatid mole they have greater vitality and power of proliferation, and so give rise to deciduoma malignum. The fact that the malignant degeneration extends along the endothelium of the maternal vessels before encroaching on the lumen makes deciduoma as distinct a form of malignant disease as sarcoma or carcinoma (Polano).

According to Haultain, the rôle of the cellular elements is to penetrate blood vessels and to exert a phagocytic influence on tissue; so long as the circulation of the blood continues proliferation goes on but so soon as coagulation and extravasation of blood take place they rapidly degenerate. The action of the cellular elements is therefore exactly the same as the tips of the chorionic villi, which penetrate the venous sinuses until the decidual cells overcome the phagocytic power of the epithelium. If the epithelium be specially active, as in hydatid mole, this proliferation continues; or if the decidua be abnormal the proliferation may occur after an apparently normal labour or abortion: thus in either case deciduoma malignum may develop.

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[1] As in the case of its occurrence in a woman aged fifty-three, after the menopause recorded by McCann: Lond. Obst. Trans., 1902, p. 294.

CHAPTER XLIV.

SARCOMA UTERI.

LITERATURE.

Chroback—Beitrag zur Kenntniss des Uterussarkoms: Archiv f. Gyn., Bd. iv., S. 549 *Clay, J.*—On Diffuse Sarcoma of the Uterus: Lancet, Jan. 1887. *Galabin*—Lond. Obst. Trans., Vol. xx. *Gessner*—Sarcoma Uteri, Veit's Handbuch d. Gyn.: Bergmann, Wiesbaden, 1899. *Gusserow*—Die Neubildungen des Uterus, S. 158: Stuttgart, 1885. *Jacubasch*—Vier Fälle von Uterussarcom: Zeitschrift f. Geburts. u. Gyn., Bd. vii., Hft. 1. *Kahlden, v.*—Das Sarkom des Uterus: Zeigler's Beiträge zur Patholog. u. Anatom., etc., Bd. xiv. *Kunert*—Ueber Sarcoma Uteri: Arch. f. Gyn., Bd. vi., S. 29. *Pick*—Ueber Sarcom des Uterus und der Vagina, etc.: Archiv f. Gyn. (1894), xlvi., S. 191. *Rogivue*—Du Sarcôme de l'utérus: Inaug. Dissert., Zürich, 1876. *Schroeder*—Die Krankheiten der weiblichen Geschlechtsorgane, S. 320: Leipsic, 1886. *Simpson, A. R.*—Contributions to Obstetrics and Gynecology, p. 240: Edinburgh, 1880. *Spiegelberg*—Sarcoma Colli Uteri hydropicum papillare: Archiv f. Gyn., Bd. xiv., S. 178. Ein weiterer Fall: *ibid.*, Bd. xv., S. 437. *Thomas*—Sarcoma of the Uterus: Lond. Obst. Journ., Vol. ii., 1875, p. 437. *Virchow*—Die krankhaften Geschwülste: Bd. ii., S. 350. *Williams, Roger*—Uterine Tumours: London, Baillière, Tindall & Cox, 1901. *Williams, Whitridge J.*—Contributions to the Histology and Histogenesis of Sarcoma of the Uterus: Amer. Jour. Obstet., 1894, Vol. xxix., p. 721. *Winkler*—Ein weiterer Fall von Sarcoma papillare hydropicum Cervicis et Vaginæ: Arch. f. Gyn., Bd. xxi., S. 309. For a full *résumé* of the literature *see* Gessner's article.

Nature of Sarcoma.

By sarcoma we understand a *connective-tissue* tumour of an embryonic type. As we trace back carcinoma to the epithelium and true myoma to the muscular fibre, so we trace back sarcoma to the connective tissue.

For the recognition of sarcomata as of connective tissue origin and the limitation of the term to malignant tumours of this type, we are indebted to Virchow. Formerly they were known in English literature as "recurrent fibroids"; the existence of this form of tumour in the uterus was recognised and fully described by Hutchinson (1857).

PATHOLOGY.

Unlike carcinoma, sarcoma rarely occurs in the cervix; in the larger proportion of cases it is in the *body* of the uterus.

It occurs in two forms:—

1. Diffuse sarcoma of the mucous membrane;
2. Circumscribed fibrous sarcoma.

Diffuse Sarcoma.

The *diffuse sarcoma of the mucous membrane* arises from the sub-epithelial connective tissue. It appears as a general swelling of the mucous membrane, which becomes soft and crumbly, or as irregular foldings or knobby projections into the uterine cavity; sometimes these projections have a polypoidal and apparently circumscribed character (fig. 269), so that this form passes insensibly into the fibrous. The masses have a greyish-white brain-like appearance, and soft pulpy consistence. The mucous membrane may be broken down, but is not deeply excavated, as in carcinoma. On microscopic examination the mucous membrane is seen to be infiltrated with masses of closely set round cells, more rarely spindle-cells. Epithelial-cell proliferation may complicate this form of sarcoma. Klebs has proposed to call such

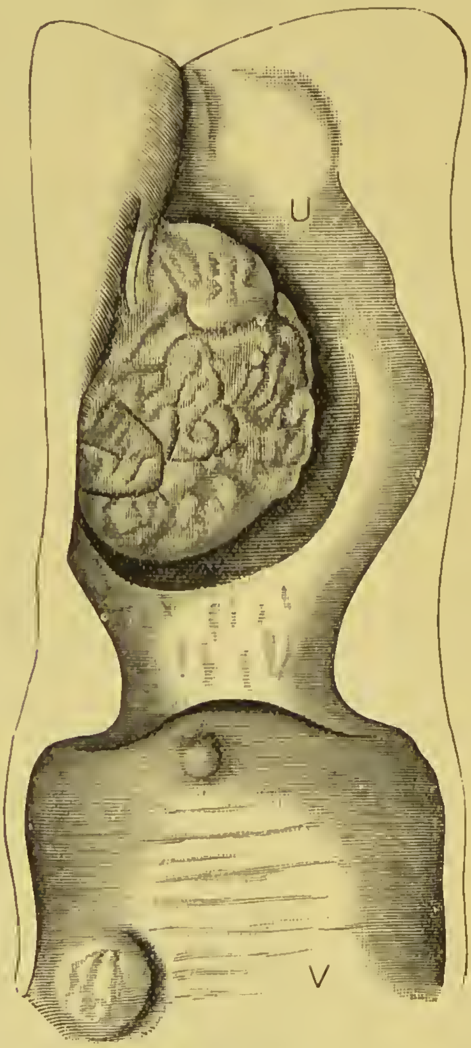

Fig. 269.

Sarcoma Uteri with Tumours in the Vagina—from a specimen in the Pathological Institute, at Strassburg (*Gusserow*).

forms carcino-sarcomata; but v. Kahlden finds no evidence of the occurrence of a mixed form of tumour.

Circumscribed Sarcoma.

The *circumscribed fibro-sarcoma* arises in the muscular coat; like the fibroid, it may be submucous, interstitial, or sub-peritoneal, and is found usually in the body, rarely in the cervix. The tumours are of a firm consistence, and feel like knots in the muscular wall of the uterus, or project as polypi into the cavity; they thus resemble small fibroids, but do not usually have a capsule. Microscopically they consist of a localised sarcomatous, generally round-celled, infiltration (fig. 270).

A case of melanotic sarcoma of the uterus has been described by Williams.[1] In some cases sarcoma is apparently a *degeneration of a fibroid tumour*, as in a specimen described by A. R. Simpson.[2] Similar cases have been reported by Ballantyne,[3] Chrobak, Müller,[4] and others. Sarcomatous cells have also been traced to the intima and adventitia of the vessels by Kleinschmidt[5] in a case of sarcoma of the cervix; and Williams[6] has traced them to the transformation of the muscular fibre of a myoma.

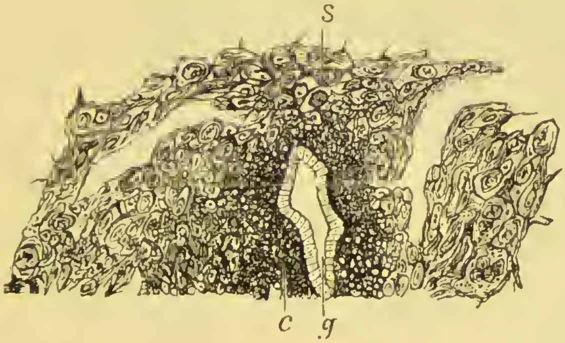

FIG. 270.

MICROSCOPIC SECTION OF THE MUCOUS MEMBRANE OF THE UTERUS IN A CASE OF SARCOMA (*Schroeder*).
s Sarcomatous tissue; *c* Small-celled infiltration; *g* Uterine gland.

Secondary nodules may form in the vagina[7] (fig. 269) and peritoneal cavity. Sometimes the peritoneum is affected by continuous spreading of the new growth outwards towards the peritoneal covering; here it causes adhesions, through which the sarcomatous infiltration may extend to other organs. A. R. Simpson records an unique case in which the infiltration spread along the mucous membrane of the Fallopian tubes[8] (fig. 271), so that from their fimbriated ends there projected

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[1] *Op cit.*, p. 755.

[2] *Loc cit.*, p. 243.

[3] Edin. Med. Jour., Nov. 1884.

[4] Zur operativen Behandlung der Uterusmyome: Archiv f. Gyn., Bd. vi., S. 125.

[5] Ueber primäres Sarkom der Cervix Uteri: Archiv f. Gyn., Vol. xxxix., p. 1, 1891.

[6] *Op. cit.*, in which microscopic drawings are given showing the transition.

[7] As in the case recorded by Galabin, who removed the vaginal nodule and the uterus by vaginal hysterectomy: Lond. Obst. Trans., 1903, p. 184.

[8] Colman describes a case in which the growth extended under the mucosa of the tube and displaced it: Amer. Jour. Obstet., 1893, Vol. xxviii., p. 811.

"round masses, having the appearance of the thrombus projecting from a small vein into a larger trunk." The uterus was of the size of a four-months' pregnancy.

Co-existence of Inversion.

A. R. Simpson draws attention to the frequency of *inversion of the uterus* as the result of sarcoma. We referred to it as a rare complication of pedunculated submucous fibroid tumours. In sarcoma it appears to occur more frequently—in four out of forty-eight cases. He attributes this to the paralysis of the muscular wall of the uterus through sarcomatous infiltration, and to the peculiar dilatability of the cervix observed in some cases.

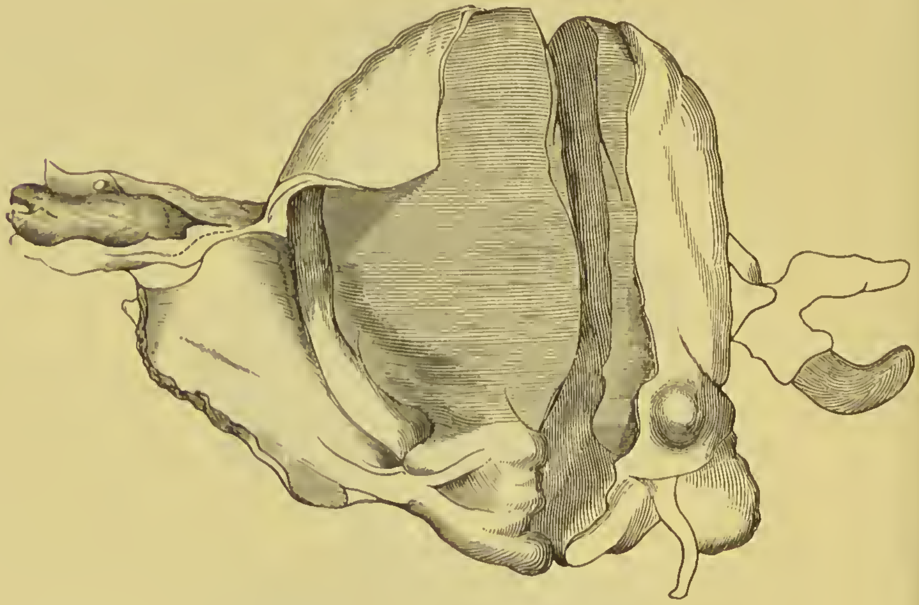

Fig. 271.

Sarcoma Uteri invading the Fallopian Tubes and projecting from their fimbriated ends (*A. R. Simpson*).

Sarcoma of the Cervix.

Sarcoma of the cervix is rare; in Winkler's paper eight cases are referred to besides his own. Two of these were spindle-celled, the rest round-celled, sarcoma. Whitridge Williams has collected only eighteen cases in addition to those of the special "grape-like form" mentioned below. In this respect sarcoma resembles fibroid tumour which we have seen to be relatively rare in the cervix.

A special form has been described as *sarcoma papillare hydropicum cervicis.* It grows as a papillary tumour which fills the vagina and may project outside the vulva. The cells are embedded in an abundant intercellular substance which stains faintly, is granular, and traversed by delicate threads. It has been erroneously described as a myxosarcoma; in Spiegelberg's cases it was shown that this intercellular substance was not mucin but coagulated lymph. Other cases have been described by Pfannenstiel[1] and Pick.[2] From the form of the tumour, it has also been called "grape-like"—*sarcoma botryoides*; the dropsical condition being due to interference with the circulation in the necks of the papillæ, which thus become œdematous as they lie free in the vagina. It is of interest as containing sometimes glandular structures, striped muscle, and even hyaline cartilage. It is not clear whether these arise from changes in the sarcoma cells, or whether this tumour may not be developed from embryonic elements.

Metastatic Deposits.

Metastatic deposits, though rare, are found more frequently in fibrosarcoma than in diffuse spreading sarcoma. They have been found in the lymphatic glands, lungs, liver, and vertebræ. Perforation of the uterine wall and death from hæmorrhage[3] and peritonitis[4] have also been noted.

ETIOLOGY AND FREQUENCY.

Of the reason why a source of irritation should lead the connective tissue to produce a sarcomatous new-formation, we know as little as why the same cause produces a carcinomatous new-formation from the epithelium.

Frequency.

It is extremely rare. Gessner finds only 18 sarcomata in 9133 cases of uterine tumour, and Roger Williams 2 in 2649.

Influence of Age.

Age has the same predisposing influence as in fibroma and carcinoma. Of seventy-six cases which we have collected from the literature, we find that

4	were	under	20,		
5	,,	between	20	and	30,
17	,,	,,	30	,,	40,
31	,,	,,	40	,,	50,
19	,,	,,	50	,,	60,
4	,,	,,	60	,,	70,
1	was	above	70.		

The cases occurring very early in life seem to be of blastogenic origin, as they develop while the organs are still rudimentary. Roger Williams mentions cases reported as occurring at 7 months, 1½ years, 3¾ years, and at later periods, which he describes as infantile forms.

Sterility a result.

The number of sterile patients among those affected with sarcoma (twenty-five out of sixty-three) is noteworthy; in this respect it contrasts with carcinoma[5] (*Gusserow*).

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[1] Das traubige Sarkom des Cervix Uteri: Virchow's Archives, cxxvii. (1892), S. 305, where he refers to twelve cases. To these we must add Pick's case, three collected by Williams, and a recent one in a girl of 19, recorded by Emmet: Am. Jour. Obst., 1902, p. 386.

[2] *Op. cit.* Pick's case was in a child two years of age. A case in a child of three has been recorded by T. C. Smith: Amer. Jour. Obstet., 1893, Vol. xxvii., p. 577.

[3] Jacubasch. *Op. cit.*

[4] By Weber and Dressler—quoted by Williams.

[5] In seventy-four cases of sarcoma, twenty-five were sterile, and sixteen had less than three children.

SYMPTOMS.

The following symptoms characterise the early stage, in which the patient seeks advice :—

1. Hæmorrhage,
2. Absence of pain,
3. Watery non-offensive discharge,
4. Cachexia.

Hæmorrhage.

Hæmorrhage appears first as increase of the menstrual flow, or as irregular hæmorrhages after the menopause. As the new-formation *does not ulcerate* rapidly like carcinoma, the increased menstruation is due to hyperæmia of the mucous membrane (*Clay*).

Pain.

The *absence of pain* in the early stage is remarked on by Clay and A. R. Simpson; in this respect it differs from intra-uterine cancer. According to Gusserow, on the other hand, pain is frequently present and that of an intense and rending character. This apparent discrepancy of opinion may be explained by the varying progress of the infiltration. In the spreading of carcinoma, we noted that pain was most severe when the disease was extending upwards and compressing the nerve endings in the uterus and connective tissue.

Discharge.

The free rice-watery discharge has a slight odour but is not nearly so offensive as in carcinoma; this is due to the fact that there is not the same rapid ulceration and necrosis of tissue. When the disease has progressed further, the discharge becomes equally fœtid. The presence in the discharge of *greyish-white shreds*, like particles of brain matter, is diagnostic; under the microscope these are seen to consist of small portions of sarcomatous tissue.

Cachexia.

Cachexia is of importance as it helps us to distinguish developing sarcoma from a non-malignant polypus; the drain from the latter may make the patient gradually anæmic, but there are not the loss of flesh, the loss of appetite, and the rapid failure of strength, which point to malignant disease.

DIAGNOSIS.

If the tumour project through the os, the diagnosis is not difficult. The age of the patient with the symptoms given above and the existence of a *soft friable* pedunculated tumour which springs *from the body* of the uterus, will point to the diagnosis; a portion, detached with the finger or curette, shows the characteristic microscopical structure. When nothing projects through the cervical canal, we dilate it by the rapid method described at p. 467. The finger recognises a soft friable condition of the mucous membrane, or a distinct polypoidal tumour, or a localised thickening in the walls.

The uterus is in some cases distinctly enlarged and may reach half-way to the umbilicus[1] or lie retroverted; in the early stages it is movable, but it soon becomes fixed.

The sound shows the cavity to be enlarged; its use causes hæmorrhage.

Differential Diagnosis.

The differential diagnosis is here often very difficult, as these conditions are also present in—

Chronic endometritis (hæmorrhagic type),
Small fibroid tumours (interstitial or polypoidal),
Carcinoma,
Deciduoma malignum.

Curetting, with microscopic examination of the scrapings, will help us in the first case.

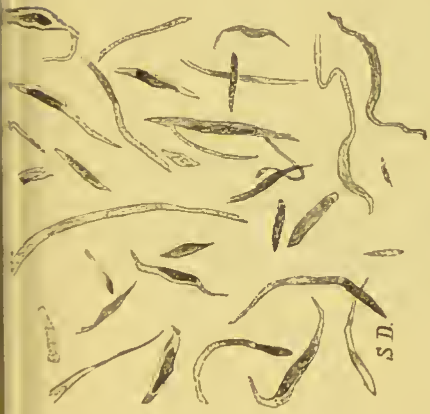

FIG. 272.

INGS FROM A FIBROID TUMOUR to show the ze and form of the muscular fibre, their rod-aped nuclei—stained, $\frac{250}{1}$; drawn by S. elépine.

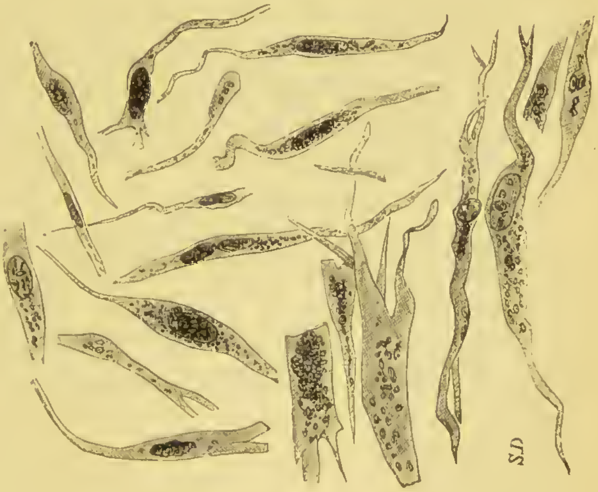

FIG. 273.

SCRAPINGS FROM A SPINDLE-CELLED SARCOMA to show the larger size of the spindle cells and their oval nuclei—stained, $\frac{250}{1}$; drawn by S. Delépine.

The removal of the polypoidal mass, with the finger nail or nail-curette, will enable us to examine its nature; the possibility of both conditions being present, polypoidal fibroid + commencing sarcomatous degeneration, must be remembered. With an interstitial thickening, we can only watch the progress of the case.

In carcinoma of the fundus, there is generally excavation of the uterine wall and the base of the ragged surface is harder than in sarcoma. The examination of scrapings is not always decisive, as the cells found in sarcoma sometimes closely resemble epithelial cells.

For deciduoma malignum, see p. 517.

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[1] Andrews records a case in which the tumour reached the umbilicus: Lond. Obst. Trans., 1900, p. 211.

PROGNOSIS.

The prognosis is grave. Compared with carcinoma, its development is not so rapid nor are the symptoms of pain and offensive discharge so aggravated in the early stage. In two of the cases recorded by A. R. Simpson the patient survived for four years after the diagnosis of sarcoma was made, and Gusserow mentions a case where the course was prolonged for ten years.

The temporary relief procured by removal is longer of duration than in carcinoma. When it returns, the development of the new tumour is more rapid than that of the first growth. Cases of non-recurrence, after hysterectomy, are rare.

As to the communication of the prognosis to the patient and friends, *see* under Carcinoma.

TREATMENT.

As in cancer, the only radical treatment is extirpation of the uterus, either by the abdominal or by the vaginal route (*v.* p. 503).

Curetting gives only temporary relief and is now chiefly used as an aid to diagnosis.

For the removal of suspicious circumscribed and polypoidal growths, the cervical canal should be well dilated so as to allow the finger to pass freely into the uterus and explore the whole of its interior. Should examination of the growth prove it to be sarcomatous, the whole uterus should be excised as soon as possible, otherwise we cannot be certain that all the disease has been removed.

SECTION VI.

AFFECTIONS OF THE VAGINA.

These we shall consider in the following order :—

Chapter XLV. Atresia Vaginæ.
,, XLVI. Vaginitis : Vaginismus : Tumours.

CHAPTER XLV.

ATRESIA VAGINÆ.

LITERATURE.

Breisky—Die Krankheiten der Vagina: Stuttgart, 1879. *Delaunay*—Étude sur le cloisonnement transversal du Vagin, etc.: Paris, 1877. *Dohrn*—Angeborne Atresia vaginalis: Archiv für Gynäk., Bd. x., S. 3. *Duncan, J. Matthews*—Case of so-called Imperforate Hymen: Lond. Obst. Tr., Vol. xxiv. *Emmet*—Principles and Practice of Gynecology, p. 188: Philadelphia, 1884. Congenital Absence and Accidental Atresia of the Vagina, etc.: Trans. Am. Gyn. Soc., ii., p. 437. *Fasola*—Contributo allo studio dell'origine dell'imene, a proposito di un caso di ematocolpo per mancanza delle parte inferiore delle vagina e dell'imene: Annal di Ostet., 1885, p. 146. *Fuld*—Salpingotomie wegen Hämatosalpinx bei Gynatresie: Archiv f. Gyn., Bd. xxxiv., S. 191. *Hart*—Transverse septal Atresia of the lower third of the Vagina: Scot. Med. and Surg. Journ., April 1897. *Leopold*—Blutansammlung im verschlossenen Uterovaginal-kanale und die Salpingotomie: Archiv f. Gyn., Bd. xxxiv., S. 371. *Puech, A.*—Des Atrésies complexes des voies génitales de la Femme: Ann. de Gynécologie: Paris, 1875. *Sänger*—Drei Fälle von Salpingo-oöphorectomia duplex bei Hæmatometra gynatresia: Cent. f. Gyn., 1896, S. 49 *Simpson, Sir J. Y.*—Diseases of Women, p. 256: Edin., 1872. *Simpson, A. R.*—Contributions to Obstetrics and Gynecology, p. 195: Edin., 1880. *Veit*—Erkrankungen der Vagina: Handbuch der Gynäkologie: Wiesbaden, 1897. *Webster, J. C.*—Some Observations regarding the Diagnosis and Treatment of Atresia Vaginæ: Amer. Jour. Obstet., 1895, Vol. ii., p 544. The literature is given fully in Veit's recent monograph.

Definition. ATRESIA (ἀ-τρῆσις, non-perforation) has been already defined as occlusion of the genital tract where the obstruction is complete and leads to accumulation of menstrual blood or mucous secretion. This occurs at three places—the *hymen*, the *vagina*, and the *cervix uteri*. Atresia of the *cervix* has been already described (*v.* Chap. XXVI.). Accumulation of blood in one-half of a *septate uterus* or *vagina* will be considered by itself at the end of this Chapter.

PATHOLOGY.

1. ATRESIA HYMENALIS.—The structure of the normal hymen has been already described (page 7). In atresia hymenalis it forms a continuous membrane, is thick and of an almost cartilaginous toughness: this explains the rarity of spontaneous cure by rupture of the membrane. This condition is produced by the occurrence of inflammatory

adhesion of the folds after their formation, that is after the nineteenth week of fœtal life. When the vagina is distended with menstrual blood, the hymen bulges forwards.[1] As the menstrual blood accumulates, the vagina distends so as to form a tense membranous-walled sac nearly filling the pelvis, and with a smaller firmer body (the undilated uterus) rising from its upper surface (*v.* fig. 276). If the tension be not relieved, the cervix next becomes dilated and may rupture. Finally the uterus itself becomes opened out, though this does not occur till late.

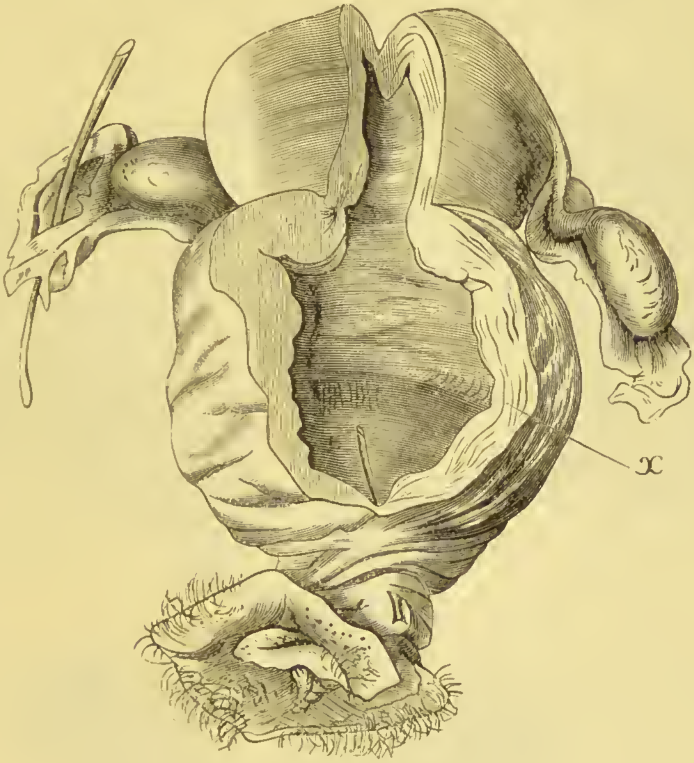

FIG. 274.

ATRESIA VAGINÆ, SEEN FROM BEHIND. Thickness of obstruction (through which a probe is passed) 3·4 *mm.*; of vaginal wall below atresia 2·3 *mm.*, *above it* (*at x*) 6 *mm.* Dilatation of the body of the uterus is small compared with the common cavity formed by cervix and upper portion of vagina. Left Fallopian tube markedly dilated, with no distinct flexion on it, and changed at its free end into a *thin-walled blood sac which had burst.* Right tube undilated. (*Breisky*).

During this period, accumulations of blood may take place in the Fallopian tubes in the form of diverticula, usually situated towards the fimbriated end (figs. 274 and 275). These may be produced by a reflux of the blood from the distended uterus into the tubes, or by hæmorrhage from the mucous membrane of the tubes themselves. That the latter may occur exceptionally has been mentioned at page 86. The uterine end of the Fallopian tube is in some cases closed.

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[1] Blood extravasations occurred into the labia in Davy's case. Lancet, 1886, ii., p. 1171.

Blood may escape gradually from the fimbriated end of the tube, and set up a localised peritonitis matting down the tube and uterus; a hæmatocele is sometimes thus produced. Veit accounts for the occlusion of the fimbriated end by a previously existing catarrh which also causes the atresia of the genital tract below. He refers to the frequency of inflammation in early childhood and thinks that the atresia arises then and not during fœtal life.

2. Atresia Vaginalis. The *thickness of the obstruction* varies in different cases, according to the extent of the original obliteration and the thinning produced by the pressure from above. The *dilatation of the vagina* above the obstruction is remarkable; it may form a tumour filling the pelvis, pressing on the bladder and rectum, and raising the uterus above the brim; the walls become *hypertrophied* as is well seen in the preparation represented in fig. 274, taken from a patient who died on the same day as the operation for atresia was performed.

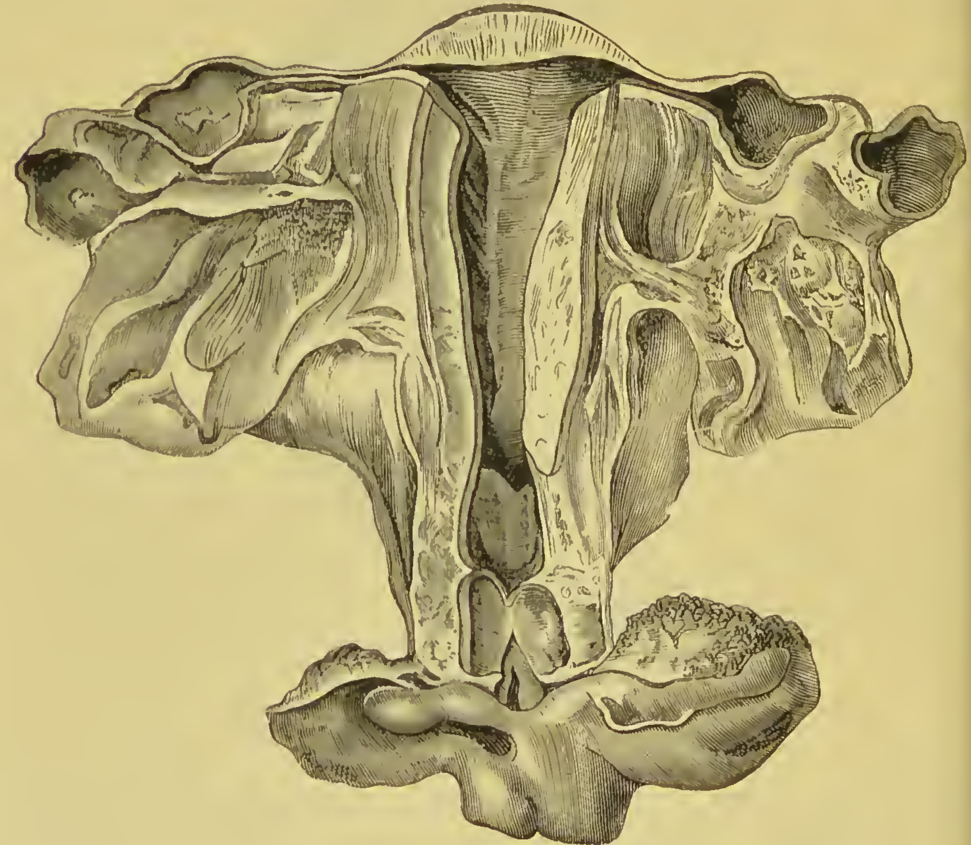

Fig. 275.

Case of Double Atresia. The *lower* affects the hymen and was *acquired;* above this was a cavity one inch long which contained purulent debris: the *upper* obstruction was one inch thick and was *congenital;* above it is the dilated uterus and cervix. The Fallopian tubes contain blood-sacs with small rents in their walls (*Breisky*, case reported by Steiner).

Seat of Obstruction.

The seat of the obstruction is most frequently in the *lower third* of the vagina. This condition may be mistaken for imperforate hymen; as the wall of the sac, bulging through the hymeneal orifice, becomes adherent to the hymen which appears as a mere fringe on the bulging membrane. There is not, however, the same distension of the vulvar orifice and perineum as in atresia hymenalis. *Atresia of the whole vagina* is usually associated with imperfect development of the uterus (*Breisky*).

Atresia may exist at more than one point in the vagina. The specimen represented in fig. 275 illustrates this. It has this further interest that the lower atresia—at the vaginal orifice—was *acquired*, the result of a fall on a block of wood when the patient was two years old; the upper atresia was *congenital*. The accumulation of menstrual blood in the upper sac called for operative interference when the patient was seventeen years of age. The lower sac contained purulent matter. On the fifteenth day after the operation, death occurred from septic peritonitis.

Character of retained Blood.

The character of the *retained menstrual blood* is peculiar. It is of a brownish chocolate-red colour, of a thick treacle-like consistence, and contains no coagula. Microscopically, it shows shrivelled red blood-corpuscles, flat epithelial cells, mucous corpuscles, extravasated blood-pigment, and granular débris. The mucus prevents coagulation; part of the fluid portion is probably reabsorbed, since the quantity removed is less than the sum of what we should expect from the successive periods passed.[1]

ETIOLOGY.

Congenital Atresia.

1. Atresia may be *congenital*, due to non-development of a part of the canal or its subsequent closure during fœtal life.

Atresia hymenalis implies that the hymeneal folds were developed (at the nineteenth week) but afterwards became blended into a continuous membrane.

Atresia of the hymen behind the vagina is, according to Dohrn, due to the fact that (at the eighteenth week of fœtal life) the walls of the genital canal become closely approximated behind the site of the hymen, so that closure of the vagina is especially favoured in that part; or according to Hart, to persistence of a septum between the Wolffian bulbs and the involution from below.

Atresia of the middle or *upper third* implies the development of the ducts and their coalescence into a vagina, with a subsequent occlusion due perhaps to inflammation (*Breisky*).

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[1] Oliver gives Bedson's chemical analysis of the retained blood: "It gave the spectrum of reduced hæmatin, and contained ·6 p.c. of urea; 100 cc. contained total solids 7·65 grms., organic compounds 6·93 grms., mineral compounds ·72 grms. In the solids were found salts, for example, chlorides, sulphates, and phosphates, and such bases as iron, calcium, magnesium, and sodium: Brit. Med. Journ., 1888, ii., p. 1160.

Complete absence of the vagina or its representation by a fibrous cord is due to the non-development of the ducts of Müller; *absence of the lower third* is occasioned by the non-extension of the ducts downwards so as to open into the cloaca.

Acquired Atresia.

2. Atresia is also *acquired*; that is, it arises during life. The most important causes which produce this condition are the following:—

- Sloughing and subsequent cicatrisation after labour;[1]
- Sloughing from impaired vitality in typhus, scarlet-fever, small-pox, and cholera;
- Cicatrisation after injuries received in childhood;
- Superficial inflammation of the mucous membrane, leading to adhesion of opposed surfaces.[2]

The commonest form of congenital atresia is due to imperforate hymen; of acquired, is due to cicatrisation of the upper part of the vagina and cervix after labour.

SYMPTOMS.

As congenital atresia is productive of bad results only in so far as it impedes the menstrual flow, symptoms do not arise till puberty. Should menstruation not take place at puberty, the condition may not attract attention till the patient enters married life.[3] Cases are, however, on record in which the accumulation of mucus has called for operative interference even in childhood.

Symptoms arise at Puberty.

At puberty the patient experiences menstrual molimina without the appearance of a discharge. As the vaginal sac distends, pain is felt in the pelvis at first only at the periods and then more continuously. With this there is also constitutional disturbance. The periods of suffering become more protracted, the intervals of relief shorter. When the dilated vagina presses on the bladder and rectum, it causes difficulty in micturition and defæcation. The abdomen swells and this, with the amenorrhœa, causes suspicion of pregnancy which is sometimes the occasion for seeking advice. If the case is left to itself it terminates fatally through rupture of the uterus or cervix (usually the latter) or of a blood sac in the Fallopian tube, or through a simple or septic peritonitis independently of rupture. In some cases, the obstructing membrane has given way by rupturing (in acquired atresia) or sloughing (in the congenital form). But even this is not a favourable termination, as the risks consequent on operative interference are still more likely to ensue when the hymen ruptures of itself.

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[1] As in the cases recorded by Holdsworth (Lancet, 1883, i., p. 949) and Cross (Amer. Jour. Obstet., 1883, p. 809, and 1886, p. 802).

[2] As in the case recorded by More Madden (Dublin Med. Journ., lxxv., p. 158), in which it developed in a multipara after a miscarriage. Heywood Smith found a complete vaginal septum formed by adhesions developing during pregnancy (Lond. Obstet. Trans., xxiii., p. 117).

[3] Zinnstag records a curious case in which an apparently imperforate hymen was not observed until labour set in; there must have been a perforation (to account for conception) at one time, but it had closed subsequently: Centralb. f. Gyn., xii., S. 219. Doléris reports a similar case: Archiv de Toc., 1886, p. 135.

DIAGNOSIS.

The importance of physical diagnosis will be evident from the following case. "A. B., æt. 16, unmarried, has for twelve months suffered from pain in the pelvis and back, with occasional acute exacerbations accompanied by nausea and vomiting. She has been treated for inflammation; and mercurial ointment had been applied to a swelling which had appeared in the left groin, on the supposition that it was an enlarged gland." Examination per rectum showed a condition similar to that seen at fig. 277; the swelling in the left groin was the elevated uterus.

The practitioner will often ask himself whether a vaginal examination is necessary. On the patient's returning several times and their being nothing in the constitutional state (phthisis, chlorosis) to explain the amenorrhœa, tell the friends that there is no apparent cause for the non-appearance of menstruation except on the supposition of a mechanical obstruction to its outflow. If there be pain in the pelvis and marked constitutional disturbance, the reasons for demanding an immediate examination will be evident. The conditions found in the various forms of atresia will be easily understood by studying figs. 276 to 279. The external genitals are first examined; a wide urethral orifice may be mistaken at first glance for the vagina, as in *atresia hymenalis* the urethral orifice is more patulous than it is normally (*Oldham*); the hymen is seen bulging forwards at the ostium vaginæ. The finger is passed into the rectum and feels that the anterior wall is

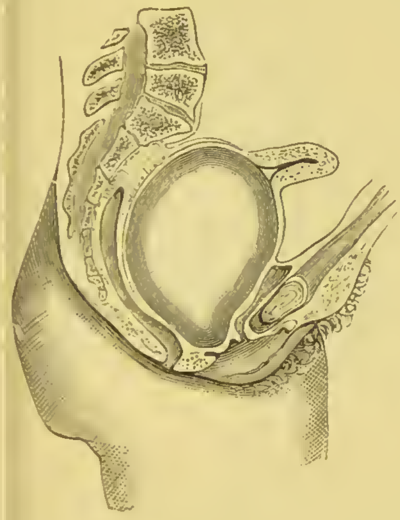

FIG. 276.

ATRESIA HYMENALIS (*Schroeder*).

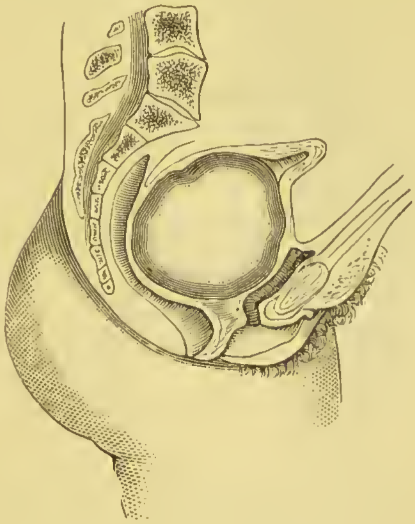

FIG. 277.

ATRESIA VAGINÆ—lower third (*Schroeder*).

made to bulge by a tense elastic sac. On bimanual (recto-abdominal) examination, this sac is felt to be equally distended and to fill the pelvis; it may extend into the abdomen as far as the umbilicus. The feeling of the sac is quite characteristic and is like that of a tense india-rubber ball; on its upper surface, the uterus is felt as a small firmer tumour.

In *atresia vaginæ* the condition is the same, except that the hymen does not bulge and that the sac does not extend so low down.

Diagnosis from Pregnancy.

Atresia of the cervix (figs. 278, 279) might be mistaken for early pregnancy; as the amenorrhœa and the distended uterus are present in both cases. But the condition of the cervix, the form of the uterus, and specially the characteristic tense feeling of the tumour, enable us to distinguish it from a pregnant uterus.

From Sarcoma.

Malignant tumours (sarcomata) have a similar elastic consistence, but with them we should not have amenorrhœa.

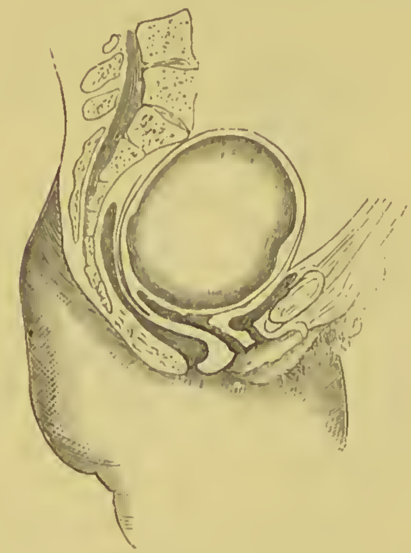

FIG. 278.

ATRESIA OF CERVIX AT OS EXTERNUM (*Schroeder*).

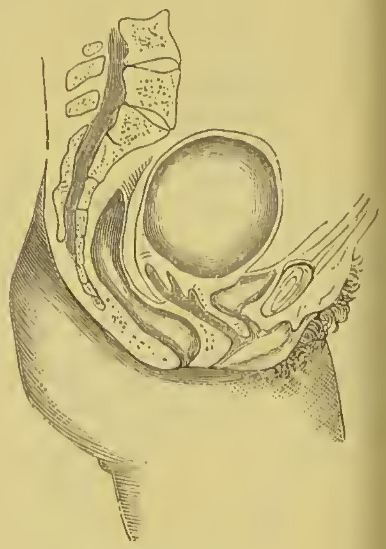

FIG. 279.

ATRESIA OF THE CERVIX AT OS INTERNUM (*Schroeder*).

It is not in all cases easy to say whether the atresia be congenital or acquired. The existence of other malformations would favour the former view, of cicatrices beside the obstruction the latter. There will also be a greater thickness of tissue felt between the urethra and rectum in the acquired form, corresponding to the obliterated vaginal canal.

Estimation of Extent of Atresia.

In atresia vaginæ it is important to estimate the distance to which atresia extends, so that we may know how much tissue we must cut through to reach the sac or the cervix uteri. This is best done by passing the index finger into the rectum till the tip is on the place where the bulging of the sac begins or where the projection of the cervix is felt; the thumb is at the same time passed into the ostium vaginæ till it reaches the obstructing membrane; the thickness of the latter can thus be estimated.

PROGNOSIS.

If menstrual blood be accumulating, the prognosis is always grave. In atresia of the hymen the prospect of cure by operative treatment is more hopeful than in congenital atresia of the vagina. In acquired atresia of the vagina, if the obstruction be removable, the prognosis is favourable. The unfavourable cases are those in which the vagina is partially or not at all developed; the prognosis as to curability by operation depends on the thickness of the tissue between the urethra and the rectum, which determines the possibility of opening up a vagina.

When menstrual blood has accumulated, while explaining to the patient's friends the necessity of immediate operative treatment, we should inform them also of the dangers attendant on the operation—the immediate danger of rupture of a blood sac in the Fallopian tube, the more remote one of simple or septic peritonitis.

The seriousness of the complication of hæmatosalpinx is seen in Fuld's statistics:[1] of sixty-five which he has collected, more than two-thirds (forty-eight) died; while seventeen were saved by operation.

TREATMENT.

The treatment consists in the formation of a channel to allow the menstrual blood to escape; in the case of imperforate hymen this is easily done by incising the membrane, but in atresia vaginæ we have to construct a new vaginal canal. Two dangers associated with this operation must be kept in view. Dangers of Operation. *First*, too rapid collapse of the sac may lead to rupture of the Fallopian tubes or of vascular adhesions round the uterus. To prevent such accidents, the operator should allow the contents of the sac to escape slowly, and should on no account apply pressure from above to hasten the process. *Second*, the operation is frequently followed by sepsis. To prevent this, antiseptics should be used. Listerism cannot be carried out here; but by washing out the sac carefully with carbolic lotion, preventing the entrance of air, and allowing free drainage when fluid collects, we greatly diminish this risk.

The danger of rupture of a hæmatosalpinx has only comparatively recently been recognised, and raises the question whether abdominal section should not first be performed in all cases where a dilated tube is recognised.[1] Fuld has collected sixty-five cases of atresia, in which the tubes were dilated and ruptured, forty-eight of whom died. Of these deaths, nine were apart from operation, but thirty-nine after the operation described above of emptying the sac from below.

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[1] *Op. cit.* These cases were collected from all sources, and before the operation for hæmatosalpinx was a recognised one.

Another danger, which follows some time after the operation, is the contraction of the new canal which, unless specially guarded against, may lead to its obliteration. Emmet expresses this well when he says "the surface of the canal is essentially a cicatricial one, and will consequently contract to a greater or less extent." To diminish the liability to contraction, he recommends that the tissues be torn with the finger nail or broken up with the scissors rather than divided with the knife; the raw surface is made to heal upon a glass plug.[2] Crede[3] prevented cicatrisation by taking a flap from the labium majus and turning it into the vagina so that it could be stitched to the cervix and to the raw surface produced by dividing the old cicatricial tissue in the vagina.

We shall describe shortly the operations for (1) imperforate hymen, (2) atresia of the vagina, (3) atresia of the cervix.

Operation for Imperforate Hymen.

1. *Imperforate Hymen.* This operation, though apparently simple, should never be performed in the consulting room but always at the patient's house or in hospital. The time chosen should be between two menstrual periods which are indicated by menstrual molimina. The hymen is punctured with a small trocar which has been rendered thoroughly clean and aseptic beforehand. The fluid is allowed to escape slowly. After it has ceased to flow, the opening in the hymen is enlarged with a knife. This incision is made in the form of a cross, or the membrane is pinched up with forceps and an elliptical portion cut out. A. R. Simpson recommends that the opening in the hymen be made with the cautery, which prevents septic absorption by the wound. We can dispense with the trocar if we take care to make at first only a small opening, which can afterwards be enlarged. A stream of warm antiseptic lotion is now made to flow gently into the cavity; the opening should be large enough to permit the fluid to flow outwards at the same time, so that the sac may be washed out without being subjected to any pressure. A plug of gauze is placed in the hymeneal orifice, and a larger pad over the vulva. The patient keeps her bed for ten days after the operation. If there be a rise of temperature or other indication of septic inflammation, the vagina should be again washed out.

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[1] Kehrer has done this once successfully, and Leopold five times—Fuld and Leopold *op. cit.* The diagnosis of hæmatosalpinx may be made, according to Fuld, either by feeling the dilated tube or finding that the amount of fluid evacuated from the vagina does not correspond to the size of the mass felt before on palpation—the latter suggesting rupture into the abdomen. Laparotomy is called for in both cases. Sänger has also published three cases—*op. cit.*

[2] In the Americ. Journ. Obst. (1887, p. 1189) he refers to his attending in her second confinement a patient on whom he had operated ten years previously to make an artificial vagina when she was fifteen years old.

[3] Archiv f. Gyn., Bd. xxii., S. 229.

Operation for Atresia Vaginæ.

2. *Atresia of the Vagina.* The patient is placed in the lithotomy posture, and the labia are retracted by the fingers of the assistants who hold the thighs. The sound is passed into the previously emptied bladder; it is then held by an assistant in such a way that the urethra and bladder are drawn well upwards towards the pubes. The index finger (with, if necessary, the second) of the left hand is introduced into the rectum, and the thickness of tissue between the finger and the sound, as well as the position of the distended sac above, carefully ascertained; the finger is kept in the rectum during the operation, both to hook that structure backwards so as to prevent its being cut into and to guide in tearing up the septum. Should the operator wish to have both his hands free to use instruments, an assistant can pass the finger into the rectum. The operator now makes with a knife a transverse incision over the hymen, or through the skin between the anus and the urethra. When the sac is reached, it is punctured and washed out with the same precautions as in the operation for imperforate hymen; it is then carefully and gently packed with antiseptic gauze. This is taken out on the following day, but a tightly fitting plug is left in the newly formed portion of the vagina to prevent its contraction; after three or four days a perforated glass plug (fig. 280) is passed in to keep the new canal dilated. The plugs are made of various thicknesses, and have a rim at the external end to prevent their being pushed in too far. The plug must not be so long as to press on the roof of the vagina, and should be of such a thickness that, while it can be easily slipped out and in by the wearer, it stretches the new canal; it is kept in position by tapes, which are fastened to the rim, and, before and behind, to an abdominal band. A pessary can be employed subsequently; some instrument may have to be worn constantly for a year or more, and where there is continued tendency to contraction, for a short period daily during many years.

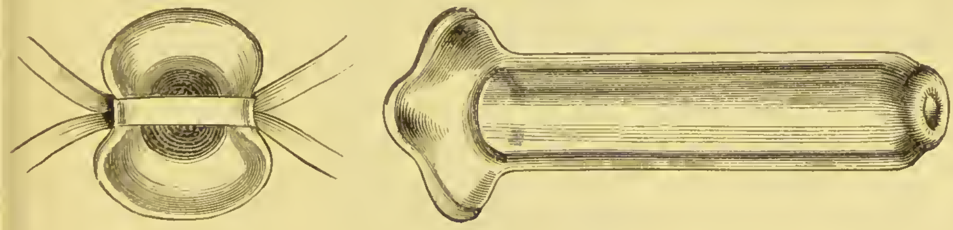

FIG. 280.

PERFORATED GLASS PLUG TO BE USED AFTER OPERATION FOR ATRESIA VAGINÆ. The left hand figure shows the external end of the tube with the tapes attached.

In a case operated on by Page, there was an accumulation of fluid in the vagina, and a second in the uterus itself which did not discharge till the cervix was incised.[1]

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[1] Lancet, 1884, i., p. 706.

This operation has been performed even when there has been no accumulation of menstrual blood. The indications for operating are thus given by Thomas: "It should be resorted to (*a*) if menstrual blood be imprisoned; (*b*) if a uterus can be distinctly discovered and the patient be suffering from absence of menstruation; (*c*) if the necessity for sexual intercourse be imperative." Cases have been recorded in which the formation of a vaginal canal has led to the establishment of menstruation when it was formerly absent, to the development of the uterus and ovaries where these were rudimentary (?), or to an improvement in the general health of the patient although there was no indication of further development in the rudimentary uterus and ovaries.

More difficulty is experienced in operating where there is no accumulation of menstrual blood and the vagina is entirely absent or represented by a fibrous cord. In such a case there is not the same necessity for surgical interference unless it be to satisfy the claims of married life. If the uterus and ovaries be well developed, and the patient be anxious to have her condition remedied, the operation is justifiable. Here we have not the distended sac as a guide to the point on which we are to cut down. The cervix, of which the position should be ascertained by a combined recto-abdominal examination, should be fixed as far as possible by an assistant's making firm pressure from above upon the uterus; there is no danger in such pressure if there be no accumulation of menstrual blood. The mode of procedure is the same as that just described.

Operation for Atresia Cervicis.

3. *Atresia of the cervix.* Usually the obstruction is so slight that the forcible passage of the sound overcomes it. Should the obstruction resist all efforts to pass the sound, we require to use the knife to open the canal. If the uterus be much distended with menstrual blood, it is safer to empty it first with the aspirator-needle passed through one of the fornices; the emptying should be effected slowly, and if the distension be considerable, at more than one sitting; rapid emptying is apt to set up uterine contractions, which may produce rupture of a dilated Fallopian tube.

Atresia of one half of a Septate Uterus and Vagina.

This form of atresia has certain characteristics which distinguish it from the other forms described above.

The chief peculiarity is that it presents the phenomena of free menstruation + those of retained menstruation.

The pathological condition is apparent from fig. 281. Spontaneous rupture of the septum with escape of the retained fluid (in this case through the patulous uterus or vagina) occurs more frequently in this than in other forms of atresia; rupture of the Fallopian tube, with its fatal consequences, is also a more frequent occurrence (*Puech*). The spontaneous rupture of the septum does not usually occur at its lowest point; hence there is liability to accumulation of purulent matter in the pouch below the point of perforation, which is a source of sepsis.

The symptoms are the same as in the other forms of atresia, but they are masked by the presence of a menstrual flow. This visible menstruation is often irregular, and profuse leucorrhœa (from the patulous cavity) is frequently present. Lackie[1] has recorded a curious case in which after operation on an atresic septate uterus a discharge of blood came periodically from the formerly atresic half, but alternating with the regular menstrual flow which had always taken place from the other half of the uterus.

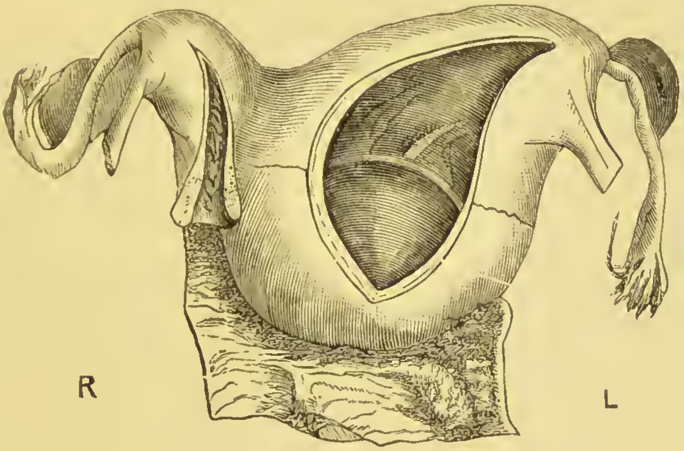

FIG. 281.

SEPTATE UTERUS. The right half is pervious, the left half has been distended with retained menstrual blood (*Schroeder*).

Physical examination shows a fluctuating tumour lying beside the uterus and alongside of the patulous vaginal canal. Sometimes it winds in a spiral manner round the latter.

The diagnosis is not difficult if the blind sac extend to the ostium vaginæ and be felt running alongside of the vaginal canal or winding round it. If, however, it be limited to the side of the uterus or only extend partially on to the vagina, it may easily be mistaken for other para-uterine tumours—most frequently for hæmatocele. To clear up the diagnosis, and also as a step towards treatment, we puncture the sac with the aspiratory-needle.[2] The character of the discharged blood will indicate the diagnosis.

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[1] Scottish Med. and Surg. Journ., 1897, p. 165.

[2] Kiderlen mentions a case from Martin's Clinique, in which about two-and-a-half pints of fluid were evacuated from the dilated right half of the vagina and uterus: Zeits. f. Geb. u. Gyn., Bd. xv., S. 1.

The treatment consists in slowly but thoroughly evacuating the sac, washing out and establishing a permanent opening from it.

A *septate vagina* is sometimes found with a septate uterus (*v.* fig. 140), both halves being pervious, so that there are no symptoms.[1] In rare cases the one vagina is imperforate. Kleinwächter[2] records an interesting case of a bulging tumour of the anterior vaginal wall resembling in position a cystocele; it ruptured and pus escaped. On laying open the fistulous tract, its walls had the naked eye and microscopic characters of vaginal mucous membrane in a state of inflammation. Traces of a septate condition may persist as bands.

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[1] Cullingworth has recorded two cases of a transverse septum in the lower part of the vagina: Lancet, 1889, 1, p. 726.

[2] Zeits. f. Geb. u. Gyn., Bd. xi., S. 254.

CHAPTER XLVI.

VAGINITIS: VAGINISMUS: TUMOURS.

LITERATURE OF VAGINITIS.

Döderlein—Ueber das Verhalten pathogener Keime zur Scheide: Deuts. med. Woch., 1893, No. 10, p. 157. Also, Das Scheidensecret und seine Bedeutung für das Puerperalfieber: Leipzig, Besold, 1892. *Hennig*—Der Katarrh der weiblichen Geschlechtsorgane. *Hildebrandt*—Monat. f. Geb., Bd. xxxii., S. 128. *Krönig*—Ueber das bakterienfeindliche Verhalten des Scheidensecretes Schwangerer: Deuts. med. Woch., 1894, No. 43, p. 819. *Macdonald, Angus*—Edin. Med. Jour., June, 1873. *Menge*—Ueber ein bakterienfeindliches Verhalten der Scheidensecrete Nichtschwangerer: Deuts. med. Woch., 1894, No. 46-48. *Menge and Krönig*—Bakteriologie des weiblichen Genitalkanales, Vol. i., 1897. *Miller, A. G.*—Four and a Half Years' Experience in the Lock Hospital, Edinburgh: Edin. Med. Journ., 1883. *Noeggerath*—Latent Gonorrhœa in the Female Sex: Am. Gyn. Trans., Vol. i., p. 268. *Ruge*—Ueber die Anatomie der Scheidenentzündung: Zeitschrift f. Gyn. u. Geb., Bd. iv., S. 133. *Schroeder*—Die Krankheiten der weiblichen Geschlechtsorgane, S. 160: Leipzig, 1879. *Veit*—Erkrankungen der Vagina: Handbuch der Gynäkologie: Wiesbaden, 1897. *Walthard*—Bakteriologische Untersuchungen des weiblichen Genitalsecretes in Graviditate und im Puerperium: Archiv f. Gyn., Bd. xlviii., p. 201. *Winckel*—Colpohyperplasia cystica, etc.: Arch. f. Gyn., Bd. ii., S. 406. *Winter*—Die Mikroorganismen im Genitalkanal der gesunden Frau: Zeits. f. Geb. u. Gyn., Bd. xiv., p. 443.

VAGINITIS.

SYNONYMS. — Colpitis (Gr. κόλπος, *a fold*): Elythritis (Gr. ἔλυτρον a sheath).

NATURE AND RELATION TO MICRO-ORGANISMS.

Relation of Structure to Inflammatory Changes,

Vaginitis is an inflammation of the mucous membrane of the vagina. The structure of this mucous membrane has been already described (*v.* p. 31). From its consisting of connective-tissue papillæ covered with several layers of squamous epithelium, it resembles the structure of the skin rather than that of a mucous membrane, few, if any, mucous glands being present. Consequently, the inflammatory changes are more allied to those of the skin than to those of a mucous membrane. Further, this peculiarity in the anatomical structure is of the first importance with regard to infection. The vagina is even more proof

and to Micro-Organisms.

than the skin against micro-organisms, since its epidermal protection[1] is not weakened by hair follicles, sweat, or sebaceous glands.

The anatomical structure of the vagina and its secretions have been recently specially studied with regard to bacteriology. The most important micro-organisms are shown in Plate IV. (p. 161). The staphylococcus pyogenes aureus is shown at figs. 1 and 2; the streptococcus and its relation to the epithelium, leucocytes, and the tissues in figs. 3 to 5; and the gonococcus at figs. 7 to 9. Fig. 9 is given because of its bearing upon the infection of the infant in its passage through a gonorrhœal vagina, which produces the most destructive form of "ophthalmia neonatorum."

Vaginal Secretions. Döderlein's View.

The normal vaginal secretion has been already referred to on p. 32. Its source and characteristics are still a matter of discussion. Döderlein would distinguish between physiological and pathological secretions: the former being markedly acid and containing a "vaginal bacillus," which causes the acidity by producing lactic acid; the latter feebly acid, neutral, or alkaline, and showing different micro-organisms, saprophytic and pathogenic. Some 50 per cent. of pregnant women have this pathological secretion in which germs flourish, and auto-infection is possible.

Could this distinction be drawn, the study of infection would be much simplified. The discharge becomes alkaline at the menstrual period, in the puerperium, and in many cases of leucorrhœa; and thus conditions arise in the vagina favourable for the growth of micro-organisms, and infection of the genital tract. Unfortunately, the results of Krönig, Menge, and Walthard do not support Döderlein's view. The question is much more complicated, and several factors are at work, the analysis of which will require much laborious investigation.

Krönig's Results.

As the result of investigations on pregnant and puerperal women, which are beyond the scope of a text-book on Gynecology, Krönig has come to the conclusion that the distinction between physiological and pathological secretion does not hold, that all secretions alike contain no pathogenic germs. All secretions are equally germicidal, although there is a difference in the vitality of the germ, the staphylococcus taking twice as long to kill as the streptococcus. A vagina becomes aseptic in two to three days. The cause of this bactericidal power is not evident. It is not chemical alone, because it is as potent whether the secretion be faintly or strongly acid. Nor is it due to a special bacillus, although some micro-organisms may be antagonistic to others. If the leucocytes play a part it must be through some property independent of their contractile power, as a temperature which destroys this does not affect their germicidal action. Nor can it be explained by the want of oxygen in the vagina, as the staphylo- and streptococci are anærobic, that is growing independent of oxygen, and yet they are killed. Nor is it mechanical, because particles of carbon and mercury are removed more slowly. Although he has thus shown that no one known factor is of itself sufficient to account for the germicidal action, it does not follow that all of these may not jointly operate.

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[1] The efficiency of this appears from Schultze's investigations as to the gonococcus. Of 104 patients with gonorrhœa, only nine showed the gonococcus in the vagina as against eighty-one in the cervix, and seventy-eight in the urethra. In explaining this, the destructive action of the secretions in these localities must be taken into account, but the like preponderance in the urethra and cervix as against the vagina suggests that the epithelial covering in which the cervix and urethra alike differ from the vagina, is an important factor: Cent. f. Gyn., 1896, S. 744.

His most important practical observation is that corrosive sublimate injections destroy the natural germicidal action, perhaps through precipitating albumen, while plain water only lessens it. Hence prophylactic injections of corrosive sublimate do harm in cases of normal secretion.

Germicidal Action of Vaginal Secretions.

For gynecological work, the investigations of Menge on *non-pregnant* patients are of peculiar interest. To determine the efficiency and rapidity of the germicidal action, he introduced pyogenic organisms into the vagina of eighty cases, and found that the vagina "cleansed itself" from these in periods varying from two-and-a-half hours to three days.[1] Several factors are concerned in this germicidal action, which, ranged according to their potency, are—various forms of bacteria, their products, acidity of secretion, a possible serum-action, leucocytes, and absence of oxygen. A weakening of their activity occurs under the following conditions—in infants, at the menstrual period, in cases of increased secretion from cervix or body of uterus or vagina itself, where the vulva is patulous or uterus prolapsed, and at the menopause.

The effect of a change in the pabulum restoring to micro-organisms a virulence which they had lost, has been for long recognised, and an interesting experiment of Walthard's must be mentioned here for its bearing on gynecological as well as obstetrical work. He inoculated the streptococcus into a rabbit's ear, and found that no serious result followed unless the ear was ligatured so as to lessen the resistance of the tissues. Under these circumstances a vaginal streptococcus became as virulent as that found in puerperal fever. Hence an innocuous streptococcus may become fed up on bruised tissues during the puerperium so as to recover a lost virulency; and the same must hold good for gynecological operations where there has been bruising of tissue, as in the enucleation of fibroids.

VARIETIES.

Gonorrhœal Vaginitis.

Until the bacteriology of the vagina is better known we shall not be in a position to classify the forms of vaginitis according to etiology. The distinction, however, between *simple* and *specific* (gonorrhœal) is of great clinical importance owing to the intractability and far-reaching effects of the latter. The distinction between acute and chronic is merely one of degree. Special varieties are the *emphysematous*, the *diphtheritic*, and the *senile vaginitis* which forms one of the physiological changes of the menopause.

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[1] He distinguishes between the vaginal orifice and the vaginal vault. The above is the time taken for the vaginal vault to become germ-free after the artificial inoculation of the secretion, the vaginal orifice naturally takes longer.

PATHOLOGY.

This has been already touched on in what has been said on micro-organisms. Of these the gonococcus is the most important for the physician to recognise, as its detection aids diagnosis. It was first described by Neisser, and has the appearance shown at fig. 8 in Plate IV. When found it is diagnostic,[1] although failure to detect it does not of course show that the secretion is not gonorrhœal.

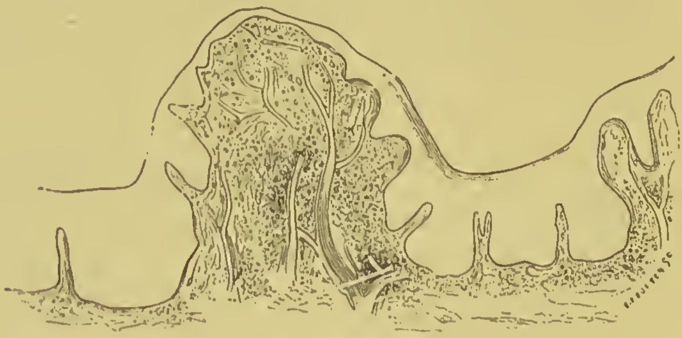

FIG. 282.

GRANULAR VAGINITIS—acute form (*Schroeder*).

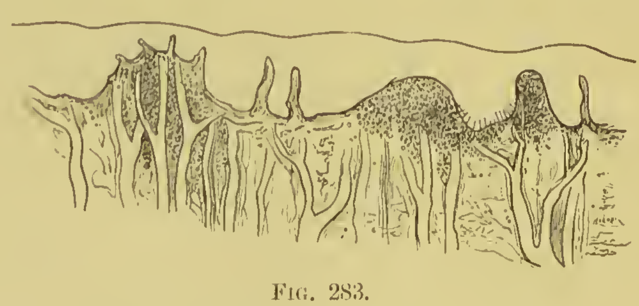

FIG. 283.

GRANULAR VAGINITIS—chronic form (*Schroeder*).

Simple Vaginitis.

As to the *anatomical changes*, we find most frequently in vaginitis slight elevations of the mucous membrane, which produce a granular surface. These granulations consist of groups of papillæ infiltrated with small cells; these swell up and push before them the stratified squamous epithelium, the superficial layers of which are shed (fig. 282). When the condition has existed some time, the surface becomes more level through the thinning of the epithelial covering (fig. 283).

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[1] Bumm—Beitrag zur Kenntniss der Gonorrhœ der weiblichen Genitalien: Archiv f. Gyn., Bd. xxiii., S. 327.

Emphysematous Vaginitis.

Associated with vaginitis in pregnancy, there is sometimes an *emphysematous condition* of the vaginal mucous membrane. Winckel has described cysts containing gas and fluid; according to Ruge, the air is present in spaces among the cellular tissue (fig. 284), while Zweifel thinks they arise from vaginal glands the ducts of which have been closed by inflammation. Oliver[1] has noted a similar condition after the menopause.

Diphtheritic Vaginitis.

Diphtheritic vaginitis, due to the bacillus of diphtheria, may occur, but in the majority of cases so described the pseudo-membrane consists of fibrin, round cells, and organisms other than the bacillus of diphtheria. It occurs either as localised patches or as an affection of the whole vagina. In the latter case the mucous membrane may be so swollen that the finger scarcely reaches the cervix, which also is found to be thickened and covered with the diphtheritic membrane.

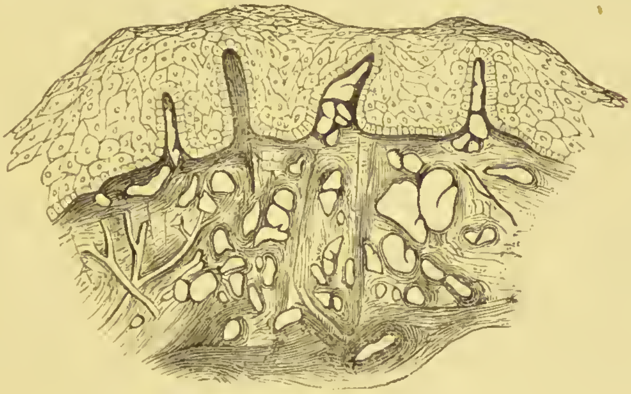

FIG. 284.

COLPITIS EMPHYSEMATOSA (*Schroeder*).

Senile Vaginitis.

The cicatrical contraction of the vagina observed after the menopause is due to a *senile vaginitis*. The epithelium is shed in patches, and the raw surfaces thus produced adhere together (*Hildebrandt*). This process is similar to that which produces occlusion of the cervical canal after the menopause.

ETIOLOGY.

The following are the most important causes:—

Gonorrhœal infection;
Irritating discharges from the uterus;
Injurious vaginal injections, badly fitting pessaries, or other causes which injure the vaginal mucous membrane;
Exanthemata.

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[1] Oliver, J.—A peculiar crackling (emphysematous) sensation in the vaginal canal: Brit. Med. Jour., 1895, p. 805.

Gonorrhœa.

Gonorrhœal infection produces the most intractable form of vaginitis, which may extend over months or years. The poison may spread along the mucous membrane of the uterus and Fallopian tubes causing endometritis (p. 336), pyosalpinx (p. 213), and pelvic peritonitis (p. 168).

Endometritis.

Irritating discharges from the uterus, as in endometritis, produce a secondary vaginitis which can only be treated by curing the uterine affection. In carcinoma and vesico-vaginal fistulæ, vaginitis arises secondarily.

Mechanical Irritants.

Among the causes which irritate or injure the vaginal mucous membrane, we mention injections of too hot water and the use of mechanical irritants for purposes of masturbation or to produce abortion, badly-fitting pessaries, tampons or pieces of sponge which have been allowed to lie some days in the vagina. Vaginitis may also develop on a patient's entering married life, simply from awkwardness in sexual intercourse; on being consulted about such cases, we must remember that *a simple vaginitis may produce most of the symptoms of one due to gonorrhœa.*

Exanthemata as a Cause.

Ulceration, with the formation of a pseudo-membrane, consisting of fibrin, round cells, and often micro-organisms, occurs usually in the puerperal condition and that through bad hygiene. The colon bacillus has been found in this *membranous vaginitis.*[1] Localised patches are seen in fistulæ, in carcinoma, and round badly-fitting pessaries. Complete *exfoliation* of the vaginal mucosa has followed the application of irritants.[2]

An *apthous vaginitis* (vaginitis micotica) has been described as occurring, especially in pregnancy and in warm weather, by von Herff.[3] The oidium lactis is found most frequently; also the monilia albicans, and other forms.

SYMPTOMS.

These are the following:—

A burning heat in the vagina;
Pain in the floor of the pelvis;
Frequent desire for micturition, with a scalding sensation while water is passing;
Free muco-purulent leucorrhœa.

These symptoms are present both in simple vaginitis and that due to gonorrhœal infection. In the latter case, the urinary symptoms are more pronounced; there is a distinct period from which all the symptoms commenced, their duration is longer, and they resist treatment; they are often complicated with those of enlarged inguinal glands, endometritis, cystitis, or pelvic peritonitis.

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[1] Stevens: Lond. Obst. Trans., 1899, p. 228.

[2] After the application of a patent medicine in the form of a vaginal suppository. Gellhorn: Am. Jour. Obst., 1901, Vol. ii., p. 842.

[3] Ueber Scheidenmykosen: Samm. Klin. Vort., N.F., No. 137.

DIAGNOSIS.

On vaginal examination, the finger recognises the discharge which escapes on separating the labia, and, in many cases, the rough condition of the mucous membrane.

The speculum shows that the mucous membrane is inflamed and covered with muco-purulent discharge; the redness is usually in the form of patches but may be diffuse.

The appearance of the cervix must be noted to ascertain that the leucorrhœal discharge does not come from it; the differentiation of discharge from the uterus and that from the vagina, is made as described on page 324.

Diagnosis of Specific Vaginitis.

The *differential diagnosis* between *simple* and *gonorrhœal* vaginitis is often very difficult. The history of a distinct source of infection is the only certain guide, and the ascertaining of this is a very delicate question. Apart from this, the following conditions point to a gonorrhœal origin: sudden development of vaginitis with urinary symptoms, in a patient who has had previously no marked leucorrhœal discharge; absence of any other cause to explain these; protracted duration of symptoms and resistance to treatment. Pus may be squeezed out of the urethra, and should be examined for the gonococcus. However convinced the practitioner may be in his own mind that the vaginitis is of a specific nature, the social unhappiness caused by his expressing a decided opinion should deter him from giving it in cases where a cause is not admitted.

Pelvic abscesses discharging through the roof of the vagina have been mistaken for vaginitis. Such a mistake will not arise when the bimanual and other methods of examination are employed. We must not be satisfied with finding vaginitis; the whole routine examination of the pelvic organs must be made after the pressing symptoms have been relieved.

TREATMENT.

In *acute cases*, rest in bed is necessary. Hot water injections are given three or four times daily, and in the dorsal posture: the douche is much more convenient than the syringe; it leaves the hands free, requires less exposure of the patient, and keeps up a steady stream (*v.* p. 139). The stream should run for a quarter of an hour. A piece of gutta-percha tubing, weighted at one end and with a clip at the other, makes a handy douche; the weighted end is placed in a ewer of water above the level of the bed, the tube is coiled up in the water so as to be filled, the clamp is put on at the other end and the tube withdrawn;

the syphon-action is started by the column of water in the tube and continues till the ewer is empty. The bowels are freely moved, and then a morphia suppository is given. Complete rest from sexual activity is absolutely necessary.

In chronic cases or after the acute stage has passed off, astringents are added to the injections, such as alum or sulphate of zinc (1 drachm to 1 pint). In gonorrhœal cases antiseptic douches should be used, of which the best is bichloride of mercury (from 1–400 to 1–2000). Where stronger application is called for nitrate of silver may be applied as follows: the vaginal walls having been first thoroughly dried, a solution of nitrate of silver (ʒj to ℥j of water) is applied and a tampon of antiseptic cotton soaked in glycerine and bismuth introduced to keep the walls apart. Or a weaker solution may be applied (10 or 20 grains to the oz.) more frequently, by pouring it into the Fergusson speculum, the patient being in the dorsal posture. Chloride of zinc (2 grs. to ℥j) is recommended by Fritsch.

Medicated Pessaries.

Applications to the vagina are usually made by means of medicated pessaries. The following are those most frequently used[1]:—

Atropine	Sedative	1-20	grain.
Belladonna	do.	2	do.
Morphia	do.	½	do.
Bismuth Oxide	Cicatrising & emollient	15	do.
Borax	do. do.	15	do.
Zinc Oxide	do. do.	15	do.
Tannin	Astringent	10	do.
Alum	do.	15	do.
Acetate of Lead and Opium	do.	5	do. 2 grs. Opium.
Gallic Acid	do.	10	do.
Persulphate of Iron	Hæmostatic	5	do.
Sulphate of Zinc (dried)	Caustic	10	do.
Iodide of Lead	Alterative & resolvent	5	do.
Mercurial	do. do.	30	do. (*Ung. Hydrarg.*)
Carbolic Acid	Deodorant	5	do.

Tampons.

Lawton's absorbent cotton[2] is the best material for vaginal tampons which are to be soaked in glycerine or other medicaments.

VAGINISMUS.

LITERATURE. *Duncan, Matthews*—Diseases of Women, p. 142: Lond., 1883. *Henrichsen*—Strictur des Scheidengewölbes, bewirkt durch Krampf des Musculus Levator Ani: Archiv f. Gyn., Bd. xxiii., S. 59. *Hildebrandt*—Ueber Krampf des Levator Ani beim Coitus: Archiv f. Gyn., Bd. iii., S. 221. *Scanzoni*—Lehrbuch der Krankheiten der weiblichen Geschlechtsorgane, S. 704: Wien, 1875. *Simpson, Sir J. Y.*—Edin. Med. Journ., Dec. 1861. And Diseases of Women, p. 284: Edin., 1872. *Sims*—Cases of Vaginismus: Americ. Med. Times, 1862, Nos. 22 to 25. *Thomas*—Diseases of Women, p. 203: Lond., 1882. *Tilt*—The Lancet, Aug. 1874.

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[1] As made up and supplied by Messrs Duncan, Flockhart & Co.

[2] Sold in packets (2 oz.—½ lb.).

By vaginismus, we understand a painful reflex contraction of the muscular fibres surrounding the vaginal orifice—just as laryngismus is applied to the same condition in the larynx. Marion Sims first drew attention to this condition. Nature.

ETIOLOGY.

It is found in some patients of a nervous and sensitive temperament without there being any local source of irritation, but this is exceptional.

Usually one of the following conditions is present:—

- An irritable spot in the fossa navicularis;
- An inflamed hymen which has not been ruptured, or irritable carunculæ myrtiformes;
- Fissures in the fourchette or round the vaginal orifice;
- Small ulcers within the hymen;
- Fissure of the anus;
- Urethral caruncle.

SYMPTOMS AND DIAGNOSIS.

Dyspareunia and sterility are the leading symptoms.

Dyspareunia.

By *dyspareunia* (a term introduced by Barnes), we understand painful or difficult sexual intercourse; hence the conditions which produce vaginismus arise on the patient's entering married life. The suffering may be so great that medical advice is at once sought; often a sense of delicacy prevents this till the condition has existed some time.

In some cases there is a careworn and anxious expression of countenance, in others a hysterical manner. As the ordinary vaginal examination is painful—the patient involuntarily drawing away as soon as the painful spot is touched—it is best to make inspection of the genitals first. Here we may see any of the conditions mentioned under Etiology. Sometimes no local cause is evident; but on carrying the finger into the vagina the reflex contraction of the muscle is felt.

Hildebrandt has shown that this muscular contraction is sometimes noticed in the upper part of the vagina, and is then due to spasm of the levator ani. Henrichsen found well-marked contraction of the levator ani in one case; he refers it to the anterior portion of the muscle which springs from the pubes and passes to the vagina near the vulva.

The possibility that the dyspareunia may be due to some local pathological condition at the roof of the vagina (prolapsed ovary or cellulitis) and not at the ostium, should be kept in mind.

The *prognosis* as to cure is good. From the distressing nature of the symptoms, and the relief obtained by the means to be described, they prove very satisfactory cases for treatment.

TREATMENT.

First remove any cause of local irritation, as urethral caruncle or irritable carunculæ myrtiformes; in some cases it is necessary to clip away carefully the whole hymen. Divide the base of irritable fissures of the anus with the knife, or touch them with the actual cautery. Iodoform in powder or made into an ointment, is the best local application to allay irritation or favour healing. Its penetrating and disagreeable odour makes many patients object to it. This is diminished by keeping Tonquin beans in the powder, and by adding oil of eucalyptus or citronelle (10 m. to ʒi) to the ointment or pessary.

℞ Iodoform	gr. x.
Olei eucalypti	M. i.
Fiat pessarium	Mitte tales xii.
Sig. As directed.	

Cocaine, 5-20°/o solution or ointment, is also useful.

After the cause has been removed, the ostium vaginæ must be dilated. This is best effected by making the patient wear a vaginal dilator night and morning, for an hour at a time; it may be made of wood or glass, and should have a bulbous end about 1½ in. long. The conical form is not good. The pain caused by the introduction passes off after a time. Dilators of gradually increasing size should be used.

If the dilator cannot be worn, we must have recourse to Sims' operation. In some cases, when the vaginismus is evidently due to the narrowness of the ostium, and especially when a reflex contraction of the muscle is noted, this operation is done without previous use of the dilators.

Sims' Operation.

Sims' operation, for vaginismus. We have already seen (p. 12) that the bulbo-cavernosi muscles embrace the ostium vaginæ and form a kind of sphincter for it; their position is seen in fig. 6. To divide the superficial fibres of this muscle is the aim of the operation.

The patient being under chloroform, two fingers of the left hand are passed into the vagina so as to stretch the ostium. With an ordinary scalpel, an incision is made on each side of the fourchette; the incision is about 2 inches long, and extends from ½ an inch above the ostium to the raphe of the perineum. The ostium is now thoroughly and firmly plugged with gauze which is kept in place with a T-bandage; thorough plugging is essential as there is often smart hæmorrhage from the incisions. Next day the gauze is removed and a glass dilator introduced, which must be worn for one or two hours night and morning during a period of several weeks.

Forcible Dilatation.

Instead of dividing the sphincter with the knife, it may be forcibly stretched with the fingers till the muscular fibre is ruptured. This is done by passing the thumbs (*Tilt*) or several fingers (*Hegar*) of each hand into the ostium, and then forcibly separating them till we feel the muscular fibre yield under the traction. The advantage of this method is that it is bloodless, and there is no granulating wound left to heal.

Pozzi's Operation.

Pozzi[1] makes a lateral incision as in Sims' operation, and dissects the mucosa back from it so as to produce a lozenge-shaped raw surface, the long axis of the lozenge corresponding to the incision. He then brings together the margins in such a way that the line of suture lies in the other axis of the lozenge, *i.e.*, at right angles to the direction of the incision, or parallel to the hymeneal orifice which is thus increased in circumference.

With these local measures, we should always combine constitutional treatment. Exercise, fresh air and change of scene are beneficial. It is self-evident that complete rest to the sexual system must be strictly enjoined during any course of local treatment; this should be maintained for some time afterwards, which may be secured by recommending a few weeks' residence from home. Tonics (such as quinine, iron, and arsenic) are given as the case requires.

TUMOURS OF THE VAGINA.

Under tumours of the vagina we briefly describe the following :—

Cysts,
Fibroid tumours,
Carcinoma,
Sarcoma,
Tuberculosis.

Syphilitic ulceration does not call for special description. Lipoma has also been described.[2]

CYSTS OF THE VAGINA.

LITERATURE. *Breisky*—Die Krankheiten der Vagina, S. 130 : Stuttgart, 1879. *De Sinéty*—Manuel pratique de Gynécologie, p. 164 : Paris, 1879. *Fischel*—Casuistischer-Beitrag zur Lehre von den Scheidencysten : Archiv f. Gyn., xxxiii., S. 121. *Gräfe*—Zehn Fälle von Vaginalcysten : Zts. f. Geb. u. Gyn., Bd. viii., S. 460. *Johnston*—A Contribution to the Study of Cysts of the Vagina : Americ. Jour. of Obstet., 1887, pp. 1121, 1241. *Lebedeff*—Beitrag zur Lehre über Vaginalcysten : Zts. f. Geb. u. Gyn., Bd. viii., S. 324. *Mundé*—Case of Cyst of the Vagina ; Americ. Jour. of Obstet., Vol. x., p. 673. *Routh*—On Cases of Associated Parovarian and Vaginal Cysts formed from a distended Gartner's duct : London Obstet. Trans., 1894, p. 152. *Rutherford, H. T.*—Cysts of the Vagina, their Etiology, Pathology, and Treatment : London Obstet. Trans., 1891, p. 354. *Veit*—Ueber einen Fall von sehr grossen Scheidencysten : Zts. f. Geb. u. Gyn., Bd. viii., S. 471. Also Erkrankungen der Vagina : Handbuch der Gynäkologie, Wiesbaden, 1897, S. 123. *Von Preuschen*—Ueber Cystenbildung in der Vagina : Virchow's Archiv., Bd. lxx., S. 3. Rutherford's and Johnston's papers discuss fully the literature of the subject.

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[1] Annal. de Gyn., 1894, tome xli., p. 591.

[2] Conrad—Cent. f. Gyn., xii., S. 214.

These, though the commonest of vaginal tumours (Winckel) have not frequently been recorded, probably because they may easily escape detection. Johnston has collected 168, to which Rutherford subsequently added 52.

Pathology of Vaginal Cysts.

Pathology. They are situated most frequently in the anterior vaginal wall, and usually in the lower third but within the ostium. They are generally single, rarely have two or more been found together. They are lined with a single layer of cylindrical epithelium which contrasts with the many layers of squamous epithelium of the vaginal mucous membrane from which they lie separate (fig. 285). We have seen them of the size of a hen's egg. Their contents vary from a clear thin fluid to a gelatinous chocolate-coloured inspissated mucus. Fischel and others have also found cysts lined with an endothelium, and he has demonstrated their connection with the lymphatics; these cysts which must be regarded as dilated lymphatics, are much rarer than those lined with cylindrical or pavement epithelium. Chéron[1] found a calculus in a cyst of the anterior wall, which communicated with the urethra; he refers to observations by Priestly, Simon, and others, of vaginal cysts associated with urethrocele, and would account for this condition by the coalescence of a cyst with the urethra.

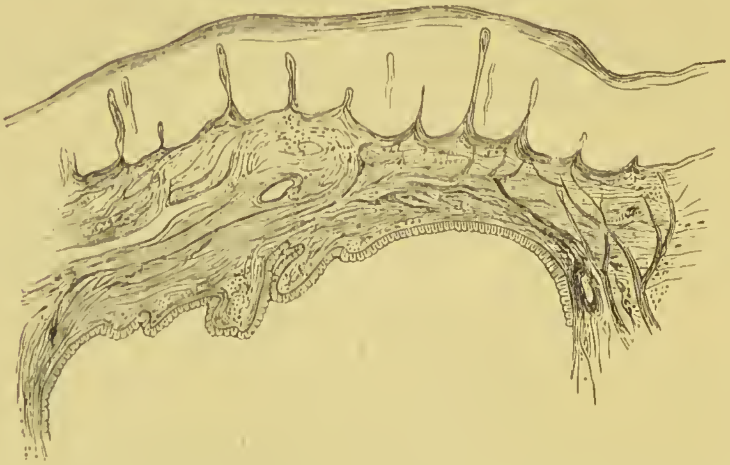

FIG. 285.

SECTION OF VAGINAL CYST (*Schroeder*). The cyst wall which is lined with a single layer of epithelium is separated by some tissue from the mucous membrane which is covered with many layers of squamous epithelium not detailed in the section.

Vaginal Cysts—Etiology.

Etiology. As there are hardly any mucous glands present in the vaginal mucous membrane, the mode of origin of these cysts is disputed. In some cases they can be traced to crypt-like depressions of the mucous membrane which become shut off (*Von Preuschen*). It has been suggested by Veit that they are due to persistence of the canals of Gartner, rudimentary structures which run alongside of the uterus and vagina (*cf.* Pl. VII., and p. 247). Routh's case in which the vaginal cyst communicated with the cyst in the layers of the broad ligament is of special interest in this connection; and cases supporting this view have been recorded by Milton[1] and Senn.[2] Freund has ascribed them to the rudiment of a Müller's duct, but the existence of this with a well-developed vagina and normal uterus is improbable. A case of suppurating hydatid of the vagina has been recorded by Porak.[3] Thorn[4] accounts for some cysts by traumatic blood and lymph extravasations.

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[1] Archives de Toc., 1887, p. 539.

Symptoms. These are often nil; and such cysts readily escape observation, so that they may be more frequent than is supposed. When of large size, they produce bearing down pain with leucorrhœa, and in some cases dyspareunia.

Diagnosis. Small cysts readily escape detection. When large, their smooth elastic surface and fluctuation make them easily recognised. They must not be confounded with cysts due to obstructed Bartholinian glands, which are situated on the labia minora or at the ostium. Careful examination will easily distinguish them from a pouching of the bladder or rectum.

Treatment. This consists in laying the cyst open and destroying its lining wall, which is best done by the cautery. Or we may cut out a portion of the cyst wall, and stitch the margins of the rest to the adjoining vaginal mucous membrane so that the cyst is taken up into the vagina; this does away with the granulating surface and subsequent cicatrisation which accompany cauterisation. If the patient is past the menopause and the cyst gives no trouble, there is no occasion to interfere.

FIBROID TUMOURS OF THE VAGINA.

LITERATURE. *Breisky*—Die Krankheiten der Vagina: Stuttgart 1886, S. 162. *A. R. Simpson*—Fibroma Vaginæ: Contributions to Obstetrics and Gynecology, p. 201: Edinburgh, 1880. *Smith*—Fibro-myomatous tumours of the Vagina: Am. Jour. Obst. 1902, Vol. i., p. 145. *Veit*—Erkrankungen der Vagina: Handbuch der Gynäkologie, 1897, S. 349.

Pathology. Fibroid tumours rarely originate in the vagina; Smith has collected 100 cases out of the literature, in addition to his own to which we may add others by Philips,[5] Targett,[6] and Munro Kerr.[7] Like fibroid tumours of the uterus, they consist chiefly of fibrous tissue with some unstriped muscular fibre; they are usually situated in the anterior wall, in 17 out of 27 cases (*A. R. Simpson*); they are pedunculated (forming so-called fibrous polypi), or sessile.

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[1] Lancet, 1893, p. 324, ii., p. 924.

[2] Amer. Jour. Obstet., 1895, Vol. i., p. 564.

[3] Archiv de Tocolog., 1884, p. 163.

[4] Centralb. f. Gyn., 1889, S. 658.

[5] Brit. Med. Jour., 1899, Vol. i., p. 262.

[6] Lond. Obst. Trans., 1899, p. 100.

[7] Lond. Obst. Trans., 1902, p. 130.

Symptoms. These are produced only when the tumour is large. In the case described by A. R. Simpson, in which the tumour was the size of two fists, it interfered with micturition and the escape of the uterine discharges. Da Costa records a case in which the tumour projected from the vulva.[1]

Diagnosis. This is easy, except in the case of large tumours when the pedicle is difficult to reach. The relation of the bladder should always be carefully ascertained by passage of the sound.

Treatment consists in division of the capsule and enucleation of the tumour when it is sessile, or ligature and division of the pedicle when it is pedunculated.

CARCINOMA OF THE VAGINA.

LITERATURE. *Breisky*—Die Krankheiten der Vagina, Billroth's Handbuch : Stuttgart, 1879, S. 151. *Bruckner*—Der Primäre Scheidenkrebs und seine Behandlung : Zeitschrift für Geburtshülfe und Gynäk., B. vi., Hft. 1, S. 110. *Fenger*—Total Extirpation of the Vagina for Carcinoma : Amer. Jour. Obst., 1893, p. 218. *Goodell*—Boston Gyn. Jour., Vol. vi., p. 383. *Küstner*—Ueber den primären Scheidenkrebs : Archiv f. Gynäk., Bd. ix., S. 279. *Mackenrodt*—Primäres Carcinom der hinteren Scheidenwand : Cent. f. Gyn., 1892, S. 529. *Oliver, J.*—Cancer of the Vagina at the age of twenty-six : Liverpool Med. Ch. Jour., 1891, p. 272. *Parry*—Primary Cancer of Vagina : Amer. Jour. of Obstet., Vol. v., p. 163 : and Philad. Med. Jour., Feb. 1873. *Simpson, A. R.*—Contributions to Obstetrics and Gynecology, p. 205 : Edinburgh, 1880.

Pathology. Primary carcinoma occurs very rarely in the vagina—in 14 out of 8287 cases (*Beigel*); in the paper cited above, Fenger has collected but 57 cases out of the whole literature. Statistics from London Hospital show that 0·43 p. c. of all cases of cancer in women are vaginal (Roger Williams). This is the more surprising when we remember how very frequently it affects the cervix. It occurs in two forms, either as a localised broad-based papillary swelling seated most frequently in the posterior wall; or as a diffuse infiltration which often constricts the canal in a ring-like manner. The inguinal glands are generally enlarged by carcinomatous infiltration.[2]

Symptoms and Diagnosis. As in carcinoma of the cervix, there is hæmorrhage and fœtid discharge: the pain is slight in the early stage. The diagnosis that there is *primary* carcinoma of the vagina is often doubtful, because it is difficult to ascertain the condition of the cervix and uterus; in the specimen represented at fig. 270 it was supposed to be primary until the post-mortem showed that it was secondary to carcinoma of the cervix. The examination per rectum is useful in these cases.

Treatment. This consists in the removal of as much as possible of the diseased tissue with the cautery, spoon, or knife. Operative methods for total extirpation of the vagina have recently been described by Olshausen[1] and Dührssen;[2] and a case has been recorded by Fenger.[3]

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[1] The tumour measured antero-posteriorly, 6½, and transversely, 4 inches: Amer. Jour. Obstet., 1895, Vol. xi., p. 940.

[2] *See* two cases reported by J. Oliver: Lancet, 1894, ii., p. 257.

SARCOMA VAGINÆ.

LITERATURE. *Breisky*—Die Krankheiten der Vagina: Billroth's Handbuch, S. 150. *Mann*—Sarcoma of the Vagina: Amer. Jour. of Obst., Vol. viii., p. 541. *Oliver, J.*—Two Cases of Primary Sarcoma of the Posterior Wall of the Vagina: Med. Press and Circ., London, 1892, p. 475. *Pick*—Ueber Sarkome des Uterus und der Vagina im Kindesalter und das primäre Scheidensarkom der Erwachsenen: Archiv f. Gyn., Bd. xlvi., S. 191. *Simpson, A. R.*—Contributions to Obstetrics and Gynecology p. 204, Edin., 1880. *Smith*—Amer. Jour. of Obst., Vol. iii., p. 671. *Spiegelberg*—Zu den Sarkomen des Uterus und der Scheide: Arch. f. Gyn., Bd. iv., S. 344. *Veit*—Erkrankungen der Vagina: Handbuch der Gynäkologie, Wiesbaden, 1897, S. 354. The literature is given in Veit's article.

Sarcoma of the vagina is still rarer than sarcoma uteri. It may arise very early in life, being sometimes apparently a congenital condition.[4] Veit distinguishes sarcoma of the vagina in children from that in adults, the former resembling a teratoma, the latter sarcoma as generally described. He gives references, in the literature, to seventeen cases of the former, and thirty of the latter. Cases have been recorded recently in the child by Lea,[5] and the adult by Macnaughton-Jones.[6] As in the uterus it is either diffuse or in circumscribed nodules (*v.* fig. 269). The symptoms are the same as in sarcoma uteri; and the treatment consists in removal (more easily effected in the circumscribed form), which, in a case reported by Spiegelberg, resulted in a permanent cure.

Schuckhardt[7] has recorded three cases of operation for its removal in children under eight years of age, with the result that one was still without return after two years; a second died from recurrence, while the third was operated on again for recurrence.

TUBERCULOSIS VAGINÆ.

LITERATURE. *Bierfreund.*—Ein Fall von Tuberculose der Vagina ohne gleichzeitige Tuberculose der ubrigen Beckenorgane: Zeits. f. Geb. u. Gyn., Band 15, S. 425, *Deschamps.*—Etudes sur quelques ulcérations rares et non vénériennes de la vulve et du vagin: Archiv de Tocolog., 1885, p. 19. *Friedländer.*—Lokaler Tuberculose: Samm. Klin. Vort., No. 64, S. 518. *Hegar.*—Die Enstehung, Diagnose, und chirurgische Behandlung der Genitaltuberculose des Weibes: Stuttgart, 1886. *Klob.*—Patholog. Anat. d. weibl. Sexualorgane, S. 432: Wien, 1864. *Veit.*—Tuberculose der Vagina: Veit's Handbuch d. Gyn., Wiesbaden, Bergmann, 1897.

It is only of importance as part of a general affection, to be treated constitutionally. Hegar divides it into primary and secondary: the former is specially liable to arise after labour when the tissues are soft, through direct infection from instruments, examining fingers or coitus; the latter takes place through the blood, or from the outside, *e.g.*, by germs from the stools. According to Veit, primary tuberculosis of the vagina alone is extremely rare, only one case having been recorded by Friedländer. In Bierfreund's case there was tuberculosis of the lung and knee-joint, which he considered secondary to that of the vagina. A case has been recently recorded by Jorfida,[1] in which it developed after delivery, the husband being quite healthy; the infection was supposed to have been from another case of phthisis.

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[1] Ueber Extirpation der Vagina: Cent. f. Gyn., 1895, S. 1.

[2] Ueber Extirpation der Vagina: Cent. f. Gyn, 1895, p. 234.

[3] *Loc. cit.*

[4] As in a case of Graenicher's where a tumour was first noticed shortly after birth, removed at 15 months, and recurred at 4th year. Centralb. f. Gyn., xiii., S. 591.

[5] A girl 2½ years old: Lond. Obst. Trans., 1900, p. 143.

[6] Brit. Gyn, Jour., 1901-2, p. 284.

[7] Ueber Sarkom der Scheide: Archiv f. Gyn., xxxii., S. 400.

Zweigbaum,[2] in reporting a case of primary tuberculosis of the cervix and vagina with secondary of the lung and intestines, has collected twenty-nine cases of tuberculosis of the vagina and cervix.

[1] Brit. Med. Jour., 1901, Vol. i., Epit. 31.

[2] Brit. Med. Journ., 1889, i., p. 93.

SECTION VII.

AFFECTIONS OF THE VULVA AND PELVIC FLOOR.

CHAPTER XLVII. The Vulva: Malformations; Inflammation; Tumours.

,, XLVIII. Rupture of the Perineum and its Operative Treatment.

,, XLIV. Displacements of the Pelvic Floor; Prolapsus Uteri Enterocele.

CHAPTER XLVII.

THE VULVA: MALFORMATIONS; INFLAMMATION; TUMOURS.

LITERATURE.

Malformations. *Hildebrandt*—Die Krankheiten der äusseren weiblichen Genitalien: Stuttgart, 1877, S. 2. *Meyer*—Virchow's Archiv, xi., p. 420. *Schroeder*—Die Krankheiten der weiblichen Geschlechtsorgane, S. 497: Leipzig, 1879. *Simpson, Sir J. Y.*—Hermaphroditism: Collected Works, Vol. ii., p. 407. *Tait, Lawson*—Am. Gyn. Trans., Vol. i., p. 318.

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MALFORMATIONS.

Development.

THESE are easily understood when we remember the normal development of the external organs of generation. 1. At the sixth week of fœtal life the *genital eminence* appears externally; at this period the rectum, allantois, and ducts of Müller communicate with one another but not with the exterior (fig. 286). 2. At the seventh or eighth week a depression of the skin (known as the *genital cleft*) occurs; this extends inwards till it meets the conjoined allantois and rectum, and thus the cloaca is formed (fig. 287). 3. The tissue between the rectum and the allantois grows downwards, and divides the cloaca into an anterior part (the *urino-genital sinus*), where the ducts of Müller end blindly in the eminence of Müller (*v.* fig. 43), and a posterior part (the anus): thus the *perineum* is formed (figs. 288 and 289). 4. The urino-genital sinus contracts in its upper portion to form the urethra; while the lower

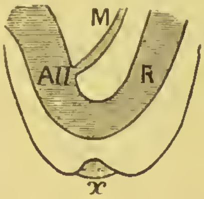

FIG. 286.

R Rectum continuous with *All* allantois (bladder) and *M* duct of Müller (vagina). *x* Depression of skin below genital prominence which grows inwards and forms vulva (*Schroeder*).

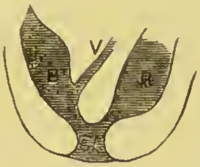

FIG. 287.

The depression has extended inwards and becoming continuous with the rectum and allantois, formed the cloaca *cl* (*Schroeder*).

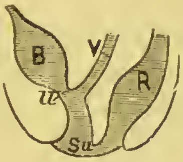

FIG. 288.

The cloaca is becoming divided into urino-genital sinus *Su* and anus by the downward growth of the perineal septum. The ducts of Müller have united into the vagina *V* (*Schroeder*).

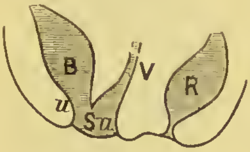

FIG. 289.

The perineum is completely formed (*Schroeder*).

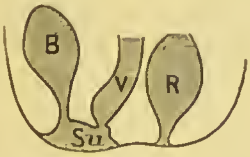

FIG. 290.

The upper part of the urino-genital sinus has contracted into the urethra; the lower portion persists as the vestibule *Su* (*Schroeder*).

part gives rise to the lower third of the vagina, the urethra, and the vestibule (fig. 290). The ducts of Müller coalesce to form the upper two-thirds of the vagina (*v.* p. 73).

The parts round the vulva develop, therefore, as follows: the *clitoris* from the genital eminence, the *labia minora* from the margins of the genital cleft, the *vestibule* from the urino-genital sinus.

Malformations.

The following malformations have been described. 1. *Complete atresia of the vulva* through the non-formation of the depression of the skin (fig. 286); the allantois and rectum either communicate, as in fig. 286, or have become separated. This condition has only been found in fœtal monstrosities. 2. *Persistence of a cloaca* so that the rectum, vagina, and urethra have a common orifice (fig. 287); such cases are sometimes spoken of as atresia of the anus, but are really due to non-formation of the recto-vaginal septum. 3. *Persistence of the urino-genital sinus* into which the bladder opens directly, as the urethra has not formed (fig. 289); in such cases the vulvar orifice is contracted and opens into a long narrow vestibule, which, at its farther end, communicates with the bladder and vagina. This condition is sometimes described as hypospadias.

HERMAPHRODITISM.

For a detailed description of this condition, with illustrative cases, the student should consult Sir J. Y. Simpson's exhaustive article on Hermaphroditism (Collected Works, Vol. ii., p. 407).

Of hermaphroditism (Ἑρμῆς and Ἀφροδίτη) there are two varieties—true and spurious.

True Hermaphroditism.

By *true Hermaphroditism* we understand that, from the Wolffian bodies, both ovaries and testicles have developed so that both forms of gland co-exist in the same individual. This is an extremely rare occurrence; when it has occurred there is a tendency towards the better development of one form of organ (determining the sex), while the other is rudimentary. According to Hildebrandt (*loc. cit.*, S. 6), only two authentic cases of bilateral hermaphroditism (ovary and testicle present on each side) have been recorded; of unilateral hermaphroditism (ovary and testicle present on one side), the other side having only one form of gland, a case has been recorded by Bannon; lateral hermaphroditism (ovary on one side and testicle on the other) has been more frequently met with, and cases, confirmed by microscopic examination, have been recorded by Berthold, Barkow, and Meyer.

False Hermaphroditism.

By *false* or *pseudo-hermaphroditism* is understood a malformation of the external organs, so that they simulate those of the opposite sex. This occurs in two forms. 1. The external organs in the female may simulate those of the male. This is due to a hypertrophy of the clitoris and its prepuce, with approximation of the labia majora (simulating a scrotum) and contraction or occlusion of the ostium vaginæ; in very rare cases the clitoris is perforated by the urethral canal. This condition is seen at fig. 291, which represents the pelvis and external organs of an infant christened as a boy; a post-mortem dissection showed that the sex was female.[1]

2. The external organs in the male may simulate those of the female; the non-closure of the lower surface of the urethra and perineum, which constitutes hypospadias, produces an appearance resembling the external organs in the female. Numerous cases are on record in which the sex of males has been mistaken, even by medical experts, and the persons have entered married life as belonging to the female sex. The penis may be small and imperforate, the urethra opening at its base;

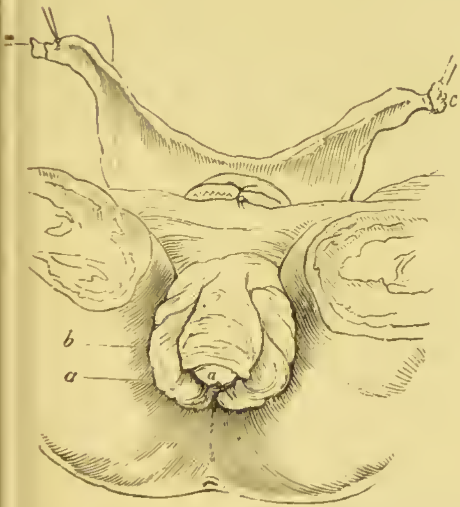

FIG. 291.

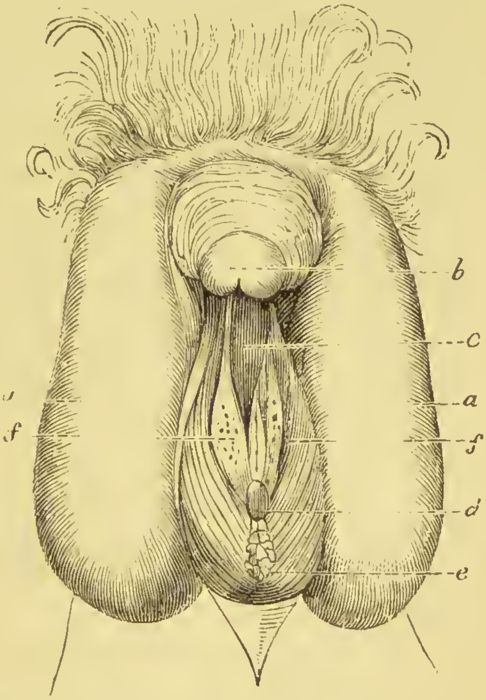

FIG. 292.

SPURIOUS HERMAPHRODITISM (*Sir J. Y. Simpson*).

Pelvis of a female infant in which the external organs simulated those of a male. *c* Uterus and appendages, *b* hypertrophied clitoris with a sulcus at its extremity *a*, which ended blindly, and did not communicate with the urethra.

Case of hypospadias in the male, making the external organs simulate those of the female. *aa* Lobes of scrotum; *b* imperforate penis, 1½ inches long; *e* perineal fissures 1½ inches deep, lined with mucous membrane, at bottom of which the urethral orifice *d* is seen; *c* the split urethra, with openings *f* of glands beside it—supposed to be orifices of prostatic ducts, of Cowper's glands, and of seminal canals.

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[1] Ramsbotham—Medical Gazette, xiii., p. 181.

the perineal fissure, lined by mucous membrane, may closely resemble the vagina; and the halves of the scrotum may appear like labia. This condition is seen at fig. 292: the case is reported by Otto;[1] the person lived in a state of wedlock with three husbands before the true sex was ascertained by medical examination.

Epispadias mistaken for Hermaphroditism.

Cases of epispadias, in which the urethra (through defect of the upper portion of the penis) is exposed along with a portion of the bladder, would only on hasty examination be mistaken for the external female organs. The exposed vesical mucous membrane with its skin margins resembles the vagina with the labia, but it is situated above the pubis; further, below the penis we find the normal scrotum and testicles.

Diagnosis. In examining a case proceed as follows. 1. Palpate the supposed labia carefully to ascertain whether testicles are present in them; the possibility of hernia of the ovaries into the labia and of non-descent of the testicle into the scrotum, must be kept in view. 2. Examine per rectum for traces of uterus or ovaries. 3. After puberty watch for the menstrual molimina or hæmorrhage in the female, and for development of sexual powers in the male. 4. Note secondary sexual characters: development of breasts, appearance of face, tone of voice, and inclination towards one or other sex.

Hermaphroditism, like malformations in general, lies beyond treatment.

INFLAMMATORY AND ULCERATIVE LESIONS.

Under this heading we shall consider—

Vulvitis,
Pruritus and Kraurosis,
Eruptions,
Ulcerative lesions—lupoid, syphilitic, tuberculous.

VULVITIS.

This may be acute or chronic, simple or specific. Erysipelatous, gangrenous, and diphtheritic forms have also been described.

Pathology. In the acute stage, the mucous membrane round the ostium vaginæ and urethra is red, swollen and painful. Sometimes the mucous glands are obstructed, and a form of acne develops; the Bartholinian glands may inflame and suppurate, producing an abscess about the size of a pigeon's egg; the sebaceous glands at the roots of the hair on the labia majora are sometimes specially affected, producing the "Folliculite vulvaire" of Huguier, an excessively rare affection. In the chronic stage, there is abundant secretion of creamy purulent matter:

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[1] Sir J. Y. Simpson—*Op. cit.*, p. 427.

when due to gonorrhœa, papillomata form round the vaginal orifice. *Erysipelatous* and *gangrenous* forms occur most frequently in cases of puerperal sepsis, but are also seen in infants after fevers. *Diphtheritic* inflammation is extremely rare; a case occurring in the puerperium, has been recorded by Whitridge Williams,[1] in which the baby, and also another child died from diphtheria.

Etiology. Vulvitis is often secondary to vaginitis, and accompanies urinary fistula and carcinoma. Want of cleanliness and protracted exercise, specially in hot weather, produce it, and that most readily in patients with much adipose tissue. It is sometimes occasioned by awkward coitus and by masturbation. In children, it is not uncommon; it is important to remember this, as the inflamed appearance of the vulva and the profuse discharge make the parents suspect that the child has been violated and has contracted specific disease. It is caused by irritation of urine, want of cleanliness, and the strumous diathesis; sometimes it takes an epidemic form in the children of a family or district. These last are probably due to spreading of gonorrhœa[2] through want of cleanliness. Some hold that vulvitis in young children is, in the majority of cases, due to gonorrhœal infection; the virus being carried on the fingers or towels or chamber utensils.[3]

The *Symptoms and Physical Signs* will be apparent from what has been said under Pathology.

Treatment. Strict attention to cleanliness must be enjoined; frequent bathing with warm water and the application of hot linseed poultices will ease pain. In children, the pain on micturition is relieved by its being done while in a warm bath. Sedative lotions such as acetate of lead and opium may be required:

R Tinct. opii. ℥ss.
Plumbi acetat. ʒi.
Aquam ad ℥vi. M.

In chronic cases, frequent washing with 2$^{\circ}/_{\circ}$ solution of carbolic or with astringent lotion is necessary. In abscess of the glands, the pus is evacuated through the gland ducts on pressure, or by free incision. Occasionally a gonorrhœa of the duct of the Bartholinian gland persists so that the duct requires to be laid open.

PRURITUS VULVÆ.

Definition. An irritable condition of the external genitals producing excessive itchiness.

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[1] Am. Jour. Obst., 1898, Vol. II., p. 180.

[2] Pott: Archiv f. Gyn., xxxii., S. 493.

[3] Drummond Robertson found the gonococcus in 41 out of 54 cases he examined; and adding the cases reported by others, says that it is present in 78 p. c.: Lond. Obst. Trans., 1899, p. 14. Barhenheim, from observations made in a Moscow Hospital extending over ten years, attributes 75 p. c. of the cases of vulvitis in childhood to gonorrhœal infection: Brit. Med. Jour., 1903, Vol. I., Epit. 63.

Pathology. The irritable region is at the upper convergent angle of the labia majora at the mons veneris; it may extend from that over the vestibule and the vaginal orifice, and sometimes over the mons veneris on to the abdomen. The pathological changes in the skin which produce this irritability are not known, because the cases are not seen in an early stage. By the time that the irritation has become so unbearable that advice is sought, the skin is inflamed and excoriated by continued scratching, which masks its original condition.

Etiology. Any irritating discharges from the vagina as in carcinoma, and even simple leucorrhœa as from senile vaginitis, may produce it. It occurs in diabetes—due to irritation from the sugar in the urine (*Friedreich*)—and in affections of the kidneys and bladder, just as similar conditions produce irritation of the penis in men. In children, it accompanies vulvitis and has been traced to the passing of the *Oxyuris Vermicularis* from the anus to the vulva. It is also caused by whatever produces congestion of the labia—hence its occurrence at the menstrual period and in early pregnancy; by irritable skin affections as herpes, eczema, and the parasitic eczema marginatum; and by pediculi.

Symptoms. The irritation is not continuous but recurs periodically. In some cases it appears only after taking a long walk or after getting warm in bed; sometimes it is most marked before the menstrual period. The irritability is slight at first but becomes aggravated by scratching. To obtain this temporary relief, the patient gradually avoids company and this, along with the constant irritation, has led in some cases to nervous depression and melancholia; sometimes the practice of masturbation is learned at the same time, and the consequent nervous symptoms gravely complicate the case.

J. C. Webster states that a fibrosis may be present in the nerve end-organs and nerves in the clitoris and labia minora; the nerves are compressed and destroyed, and sub-acute inflammatory changes are found in the connective-tissue of the affected skin.

Diagnosis. As the most hopeful cases for treatment are those in which a distinct removable cause is found, a thorough examination is necessary: (1) Carefully inspect the external genitals for irritating skin eruptions, and examine scrapings of the affected parts microscopically for parasites; (2) expose the vagina and cervix thoroughly with the speculum to ascertain whether there is irritating leucorrhœa, the plugging of the vagina with cotton wadding to check discharge from the vagina or cervix will help us to exclude this; (3) test the urine for albumen and sugar; (4) examine per rectum for any source of irritation there.

Treatment of Pruritus.

Treatment. We must first remove the cause. When parasites are present, a mercurial or sulphur ointment is required; with vaginal or cervical catarrh, a tampon of wadding and glycerine (with acetate of lead ʒii to ℥i) in the vagina will check the irritating discharge. Attention to diet (which should consist largely of vegetables) and to the regular action of the bowels is necessary; when the gouty diathesis (with which pruritis is often associated in old patients) is present, lithia water is useful. It is a safe rule to forbid all stimulants. Frequent vaginal injections or sponging with warm water, followed by the application of boracic ointment or bismuth, will relieve mild cases; in more severe, the patient should have, several times a day, a warm sitz-bath combined with the douche; after this, iodoform is dusted over the vestibule, or, if the patient is recumbent, lint soaked in acetate of lead and opium lotion is laid between the separated labia. In some cases, chloroform and almond oil have given relief (*Scanzoni*).

R Chloroformi ʒii.
Olei amygdalae ℥ii. M.
Sig. Apply externally as directed.

Preparations of mercury give benefit in other cases.

R Hydrargyri perchloridi ʒss.
Aquæ ℥vi. M.
Sig. Apply externally as directed.

Schroeder has seen very good results from the application of carbolic acid of varying strength—1 to 40 up to 1 to 10. Solid menthol is also used. Where milder measures have failed, solid nitrate of silver well rubbed into the irritated parts and followed by cold water dressing has given relief. In parasitic cases a lotion of equal parts of sulphurous acid and glycerine may be used. To procure rest at night, morphia and chloral may be necessary; Hildebrandt has found tinct. cannabis Indicæ (m. 10-20) even more effective than these. A 4 per cent. solution of cocaine may be tried. Application of galvanic current has been used with success.[1]

When medical treatment fails, as it very often does, a cure may be effected by clipping away the affected skin, and bringing together the raw parts with a continuous catgut suture.

Kraurosis Vulvæ.

Kraurosis vulvæ or Atrophy of the Genitals. In old women the pudenda shrink; the labia minora become very small; the vestibule atrophies and shrinks, making the urethral orifice patulous and causing painful ulceration (*v.* fig. 320). Microscopically, Breisky found the sebaceous glands of the labia few, a cicatricial condition of the papillæ and thinness of the rete Malpighii. The sweat glands were also diminished in number.

In the early stages, vascular patches appear round the orifice of the vagina, which are very tender. There is pain on micturition, sometimes on walking, and coition becomes impossible. In the advanced stage the skin becomes thick and rough, and of a pearly white colour over the affected area. Of its etiology little is known, beyond that it seems to be a trophic disturbance, no micro-organism or other exciting cause having been found. Antiseptic douches, followed by astringents, dusting with boracic powder, and phenazone in doses of 5-10 grains relieve the pain or itching. In severe cases excision of the affected area gives relief, as in pruritus.

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[1] Blackwood, Polyclinic, 1885, No. 9; and v. Campe, Central. f. Gyn., Bd. xi., S. 521.

Leucoma of the vulva, in which white areas of horny epithelium appear on the vulva, similar to those found in the buccal mucous membrane, has been drawn attention to by Butlin.[1] He records three cases and gives the literature. He thinks that gout and rheumatism, but not syphilis, have to do with its development, and has found the condition in the mouth and vulva of the same patient. Apparently it predisposes to cancer, which developed in his three cases.

ERUPTIONS ON THE VULVA.

The skin round the vulvar orifice may be affected with any of the eruptions found on the other parts of the body. Of these the most important are erysipelas, eczema, prurigo, herpes, acne. These eruptions have the same characters as when they occur in other situations, and their treatment is the same. Condylomata may be found on the skin, and mucous patches over mucous surfaces. Eczema is frequently caused by diabetes, as pointed out by Lécorché.[2] Hebra's plates of Skin Diseases illustrate these conditions very well; *see* also a paper in the Annales de Dermatologie et Syphilographie for April 1882, by Gougenheim and Soyer.

ULCERATIVE LESIONS OF THE VULVA—LUPOID, SYPHILITIC, TUBERCULOUS.

Under this head[3] we include a variety of conditions, which used to be described under the term of "Lupus." Of these some may be true lupus, while others are syphilitic, tuberculous, or due to other micro-organisms.

Lupus Vulvæ.

Lupus vulvæ is a condition drawn attention to by Huguier, West, Taylor, Matthews Duncan, and Angus Macdonald. Duncan has considered it very fully, and an able histological examination of his specimens was made by George Thin. It may be defined as a chronic hypertrophic condition of the pudenda, prone to ulcerate and erode, causing little pain, lasting long, and not infecting neighbouring glands or causing ill health.

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[1] Leucoma or Leucoplakia of the Vulva: Brit. Med. Jour., 1901, Vol. II., p. 61.

[2] Du diabéte dans ses rapports avec la vie utérine, etc.: Annales de Gyn., Oct. 1885.

[3] Veit has grouped similar conditions under the name of *ulcus rodens vulvæ.*

Pathology.

As to its pathology, it is a hypertrophic condition with tendency to ulcerate and cause stricture of urethra, vagina, or rectum. Pus is secreted by the ulcerated surface, and occasionally considerable destruction of parts is caused. The hypertrophy may be small (lupus minimus), large (lupus hypertrophicus), or forming irregular masses extending to the hip. Other terms have been used, viz., lupus prominens, lupus serpiginosus; it was termed by Huguier, "Herpes l'Esthiomène."

Microscopic Examination.

On microscopic examination, Thin found growth of fibrous tissue (ordinary white fibrous tissue) and absence of any neoplastic structure; exudation cells were also present. Blood-vessels were unusually numerous. The appearances thus differ from lupus vulgaris, cancer, or syphilis; they are somewhat analogous to elephantiasis, but differ from that condition in the non-implication of the lymphatics and the presence of inflammatory action.

Symptoms and Physical Signs.

The symptoms may be slight and not attract the patient's attention unless hæmorrhage or inflammation occurs. The physical signs are those of hypertrophy, ulceration, erosion, lasting for years, not implicating glands, and not markedly affecting the patient's health. Large hypertrophies usually affect the clitoris and labia majora; small ones, the urethral orifice and hymen (*Duncan*). The vagina and uterus may become affected.

Diagnosis.

Some cases described as lupus are undoubtedly *syphilitic*. One of the cases described by Angus Macdonald as lupus was shown subsequently by Norman Walker to be a case of ulcus serpiginosum.[1]

This is "a form of ulcer commencing in the genital region and in the course of months and years extending in a perfectly concentric manner over a great part of the neighbouring regions of the extremity; it is completely different from the spontaneously healing ulcus molle, although at the commencement it is not easily distinguished from it."[2]

On microscopic section, peculiarly shaped cells are found round the vessels, which are "plasma cells" (Unna). At the advancing edge are found short bacilli arranged in chains, which are probably the cause of the ulceration.

Unna regards it as a venereal disease, though less infectious than the "ulcus molle." It is a rare condition, only a few cases having been recorded.

Fig. 293 is a section, under a high power, of the tissue removed from a case. It shows the large nucleated round cells. The methyl-blue stain brought out, here and there, small bacilli though less abundant than in the cases described by Unna.

Other cases are associated with *tuberculosis*. Beyea[3] describes the case of a woman with general abdominal tuberculosis, in whom an ulcer formed on the vulva. This had all the appearance of a tuberculous lesion, and yet on microscopic examination there were no giant cells, caseation, or tubercle bacilli, only a small-celled infiltration. He states that true tuberculosis of the vulva is an extremely rare disease.

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[1] For history of this case *see* A. H. F. Barbour and Norman Walker—"On Ulcus Serpiginosum Vulvæ": Scot. Med. and Surg. Journ., July, 1897.

[2] Unna's "Histopathology," translated by Norman Walker.

[3] Chronic Inflammatory Hyperplasia of the Vulva. Beyea: Am. Jour. Obst., 1898, Vol. ii., p. 315.

In yet other cases of slow ulceration with hypertrophy, other *pathogenic micro-organisms* have been described. Thus, Grace Peckham-Murray obtained from a case of slow ulceration of the vulva in a woman of sixty years of age pure cultures of a streptothrix, which, on experimental inoculation, caused death in mice and rabbits, but not in guinea-pigs. The epithelium at the edge of the ulceration was invaded by threads of the fungus.

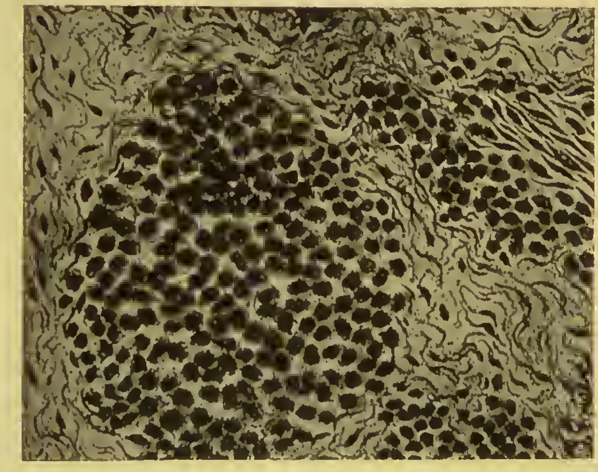

Fig. 293.

Microscopic Section of Tissue from a case of Ulcus Serpiginosum.

A case of *actinomycosis* of the vulva, of which only two similar cases have been recorded, has been recently reported by Bengartz.[1] The fistulous tracts on the labium majus, when split up and scraped, gave the actinomyces.

TUMOURS OF THE VULVA.

Under these we shall notice briefly—

Cysts of the Bartholinian glands,
Elephantiasis,
Neuroma,
Fibroma,
Lipoma,
Carcinoma,
Sarcoma.

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[1] Monats f. Geb. u. Gyn., 1902; Brit. Med Jour., 1903, Vol. i., Epit. 35.

This is also the most convenient place to refer to

Pudendal hernia,
Varix, hæmatoma and hæmorrhage.

Cysts and Abscess of Bartholinian Gland.

Cysts of the Bartholinian glands. The Bartholinian or vulvo-vaginal glands, which are the analogue of Cowper's glands in the male, are situated at each side of the ostium vaginæ (*see* fig. 6); their ducts (about 2 cm. long and wide enough to admit a fine probe) run upwards to about the middle of the ostium vaginæ, where their mouths may be seen in front of the hymen.

A cyst may form by dilatation of the *ducts* or of the *glands* themselves. When due to distension of the duct, it has at first an elongated oval form; when the gland itself is affected, there may be multiple cysts or a lobulated swelling. They generally occur on the left side.[1] The contents are thick mucus, which is clear or of a brownish tinge. Suppuration may occur and abscess form (*v.* fig. 294).

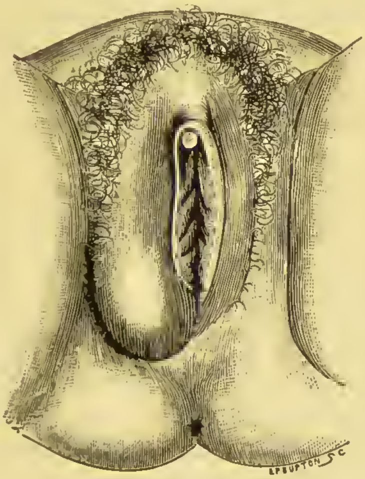

FIG. 294.
ABSCESS OF THE BARTHOLINIAN GLAND (*Huguier*).

The symptoms are due to the discomfort of the swelling, which is most felt on walking. The diagnosis is easy, from the position of the swelling and its fluctuating character; when it has developed during the puerperium, we must differentiate it from hæmatoma (which after a time becomes firm from coagulation) and inflammation after injury.

The treatment consists in complete evacuation of the cyst and destruction of its walls. It is not sufficient to open it and allow the fluid to escape; we must cut out a portion of the wall and then plug the cyst with antiseptic gauze. By far the best instrument is the thermo-cautery: we first puncture the cyst with it; when the fluid has escaped, we pick up the outer cyst wall with forceps and lay it freely open with the cautery; we then cauterise the inner wall also. A piece of antiseptic gauze is laid over the wound.

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[1] Bonnet: Gaz. des Hôpitaux, 1888, No. 69.

Cysts also occur in the labia minora[1]; they are very rare and their pathology is not known.

Elephantiasis.

Elephantiasis. This is a common condition in tropical countries, but is comparatively rare in Europe and America although a minor degree of it is occasionally met with.

The pathological changes consist in a dilatation of the lymphatic spaces and ducts, with secondary formation of connective tissue and thickening of the layers of the cutis vera; sometimes the papillæ are specially enlarged, producing swellings which resemble condylomata in form. The labia majora are most frequently affected, next in frequency the clitoris; more rarely are the labia minora hypertrophied (*Mayer*).

It develops, according to Mayer, most frequently at ages of from 20 to 30 years—that is in the period of sexual activity. It has been traced to direct injury, but the most fruitful cause of minor degrees of hypertrophy is syphilis.

The symptoms are due to the weight and discomfort of the tumour which may reach to the knees. For drawings of the various forms, Esmarck and Kulenkampff's monograph Die Elephantiaschenformen (Hamburg, 1885) may be consulted. The treatment of the larger growths is removal with the thermo-cautery or knife.

Neuroma.

Neuroma, an exquisitely sensitive red papule which resembles a urethral caruncle, has been described by Sir J. Y. Simpson (*see* fig. 320); its occurrence, except at the urethral orifice, is extremely rare.

Fibroma.

Fibroma. This springs from the labia majora, resembles in structure fibroid tumours of the uterus, and, like them, is embedded in cellular tissue or hangs down by a pedicle. Taylor has reported a case of fibroid of the vestibule.[2]

Lipoma.

Lipoma may arise from the fatty tissue of the mons veneris or labia majora. Emmet[3] described a case in which the tumour hung down to the patient's knees and was supported in a bag round the waist; Stiegele[4] removed one which weighed 10 lbs.

Carcinoma.

Carcinoma of the vulva is rare in comparison with its frequency in the uterus. In 16,637 cases of tumours of the female sexual organs, Gwilt found that 7479 were cancerous; and of these, 72 (or 1 per cent.) were vulvar. The most frequent form is the epithelioma. It begins, usually on the inner surface of the labia majora, as small round nodules which elevate the skin; they may remain for a long time unnoticed, as their growth is at first slow and painless. After ulceration they spread more rapidly, and extend forwards and backwards but rarely into the vagina. The inguinal glands are early involved.

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[1] Smith removed two such cysts: Brit. Med. Journ., 1888, i., 250.

[2] Americ. Journ. Obstet., 1888, p. 434.

[3] *Op. cit.*, p. 601.

[4] Zeits. f. Chiru. Geb., Bd. ix., S. 243.

Complete removal before the glands are affected, is the only treatment. Küstner has advocated removal of the inguinal glands of the affected side if these are larger than those on the healthy side.

Sarcoma of the vulva is very rare. Geith and Terrillon[1] have recorded cases of melanotic sarcoma. Haeckel has collected 10 cases of melanotic tumours,[2] mostly sarcomatous.

Pudendal Hernia.

Pudendal hernia. This corresponds to scrotal hernia in the male. The round ligaments are the analogues of the spermatic cord, and after emerging from the inguinal canal pass into the substance of the labia majora which correspond to the scrotum; if the process of peritoneum surrounding the round ligaments—known as the canal of Nuck—does not become obliterated at birth, it forms a track for the hernia. In some very rare cases a hernia appears at the lower end of the labium majus, apparently directly from the pelvis.

Though it be very rare, the possibility of a hernia must be kept in mind on examining a tumour of the labia; the crackling feeling, the impulse communicated on coughing, and disappearance on taxis, indicate hernia. The serious consequences of cutting into such a hernia, by mistake for an abscess, are self-evident.

Varix.

Varix. The plexus of veins which forms the erectile tissue of the bulbi vaginæ has been already referred to (*v.* p. 12 and fig. 6). A varicose condition of the veins sometimes occurs in pregnancy and with pelvic tumours. In a case described by Holden,[3] they formed, when the patient was erect, a tumour of the size of a child's head. When these vessels rupture and the blood is effused into the cellular tissue, a hæmatoma is formed.

Hæmatoma.

Hæmatoma. This condition is also called "Thrombus" and "Hæmatocele" of the vulva; the former term should be limited to a coagulum within a vein, and the latter to blood effusion into the peritoneal cavity. It arises most frequently during labour, from injury produced by the child's head; the effusion may appear rapidly, as a tumour from the size of a walnut to an orange or larger, or may take place gradually. It has also been known to occur independent of labour or pregnancy, as the result of a blow or violent muscular effort.

The treatment consists in the application of ice to the vulva, and regular evacuation of the bladder and rectum without the patient's being allowed to strain. With this treatment, the mass may be absorbed. Should inflammation occur, poultices are applied and pus is evacuated with the knife; if this occurs in the puerperal condition, special care is required to keep the wound aseptic by repeated washing with carbolic solution and dressing with carbolised lint.

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[1] Ann. de Gyn., Bd. xxvi., p. 1.

[2] Archiv f. Gyn., xxxii., p. 400.

[3] "Immense Vulvar and Vaginal Varix:" N. Y. Med. Record, July 1868.

External Hæmorrhage.

External hæmorrhage from ruptured veins sometimes occurs. The rupture may be caused by muscular straining, or by a blow or wound of the vulva. The dilated state of the veins makes such an injury serious during pregnancy, and several cases of a fatal result from a blow or kick have been the subject of a criminal prosecution (*Sir J. Y. Simpson*). The vascular tissues are forcibly driven against the pubic arch and cut on it. In a case recorded by Hyde,[1] hæmorrhage from a vein ruptured by a fall proved fatal in forty minutes. Those who suffer from varicose veins should lie down for some hours during each day; should a vein rupture, the patient must lie down at once and apply pressure to the bleeding point.

[1] Lond. Obst. Trans., Vol. x.

CHAPTER XLVIII.

RUPTURE OF THE PERINEUM AND ITS OPERATIVE TREATMENT.

LITERATURE.

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Preliminaries.

The significance of rupture of the perineum is now more fairly estimated than formerly, and it is generally conceded that where this lesion gives rise to disagreeable symptoms its repair should be performed. We have therefore to consider in the present chapter the following points:—

(1.) Anatomy of the parts concerned,
(2.) Pathology and Varieties,
(3.) Etiology and Clinical Significance,
(4.) Treatment.

ANATOMY OF THE PARTS CONCERNED.

It has already been pointed out that in the pelvic floor we must recognise two segments, the pubic and sacral. The latter is the one specially concerning us now. It is seen in section at fig. 295, and is the part driven back and distended from side to side during labour by the advancing head. It is thus liable to the lacerations and stretching we shall speak of afterwards.

The perineum is the inferior angle of the sacral segment, and is, in the virgin condition, made up of:—

(1.) Posterior vaginal wall in front of upper part of perineal body,
(2.) Hymen,
(3.) Fossa navicularis,
(4.) Fourchette,
(5.) Perineal body and skin over its base.

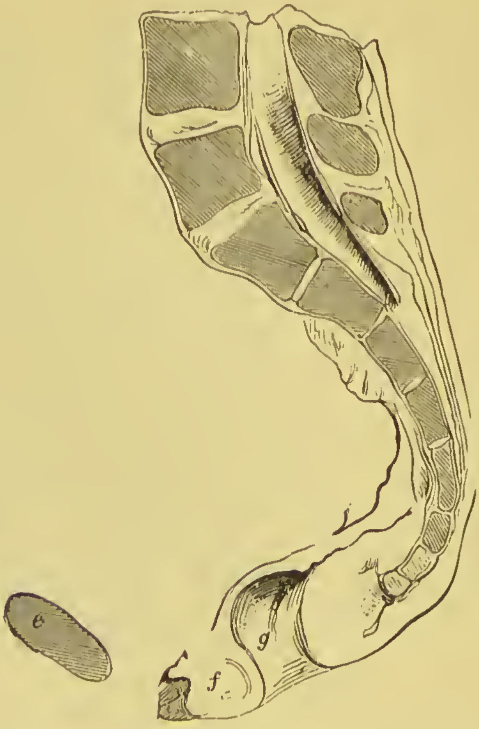

Fig. 295.

The Sacral or supporting Segment of the Pelvic Floor (*Hart*). *e* Symphisis pubis; *f* perineum or inferior angle of sacral segment; *g* anus.

The *Perineal body* lies in front of the anus and its greater portion is below the level of the vaginal entrance, *i.e.*, is below the level of the pelvic floor proper (*v.* Pl. II.). In it are united the following muscles, levator ani (anterior portion) bulbo-cavernosus, transversus perinei, sphincter ani. The fibres of the levator ani are in close lateral contiguity to the vagina, inserted into the perineal body, and sling up the rectum, behind which they pass. Any laceration involving this muscle, as it often does, must therefore cause a loss of support and bulging of parts at the vaginal entrance.

Another point to be kept in mind is the anatomy of the triangular ligament. This is a piece of sheet-fascia filling up the pubic arch and perforated by the vagina and urethra. It strengthens the vaginal walls by its grip, and, according to Emmet, prevents their eversion. He believes that the bearing down complained of by some women, and associated with a lax condition of the vaginal walls or the existence of rectocele, is due to undue distension of this fascia, and separation of its lateral attachments; special operations were devised to restore this grip, but it is generally held that any good is through the stitches laying hold of levator fibres coming from the pubes and pubic arch.

The tone and position of the lower part of the vagina is thus due,

1. To a slinging action of levator ani muscles—their rupture destroys this,
2. To the rigidity of the triangular ligament,
3. To the firm muscular knot of the perineal body which, when intact, gives the slinging power of the levator ani fibres a point on which to act.

The useful function of the perineal body as a mere mechanical plug has been exaggerated, and it cannot act in this way owing to its position. Its use as a "muscular knot" is however very great.

PATHOLOGY AND VARIETIES.

Pathology and Varieties.

It should be kept in mind that both the vaginal orifice and the vulvar orifice are antero-posterior.

When the fœtal head is passing through the vaginal orifice, it distends it all round; while, when passing through the vulvar orifice, it distends the posterior half mainly, *i.e.*, it does not stretch so much those parts of the vulva lying in front of the level of the meatus urinarius.

As the result of normal and abnormal childbirth, we get certain tears of the inferior end of the perineum, considered anatomically at present. In all primiparæ there is laceration of at least the hymeneal orifice, usually mesial and posterior—the "inevitable laceration" of Matthews Duncan. There may be also laceration of the following structures: (*a*) the vaginal orifice, radiating; (*b*) vestibule; (*c*) fourchette; (*d*) labia minora; (*e*) perineal body to a varying depth, the most extensive involving the sphincter ani. Further, there is sometimes central rupture of the perineum. In this lesion, the skin over the base of the perineal body alone may be involved or only the vagina may be torn. Rarely do we find a lesion of vaginal wall, connective tissue, and skin, with an unruptured band of tissue between it and the fourchette—central tear (fig. 296), or perforation through the inferior angle of the thinned-out

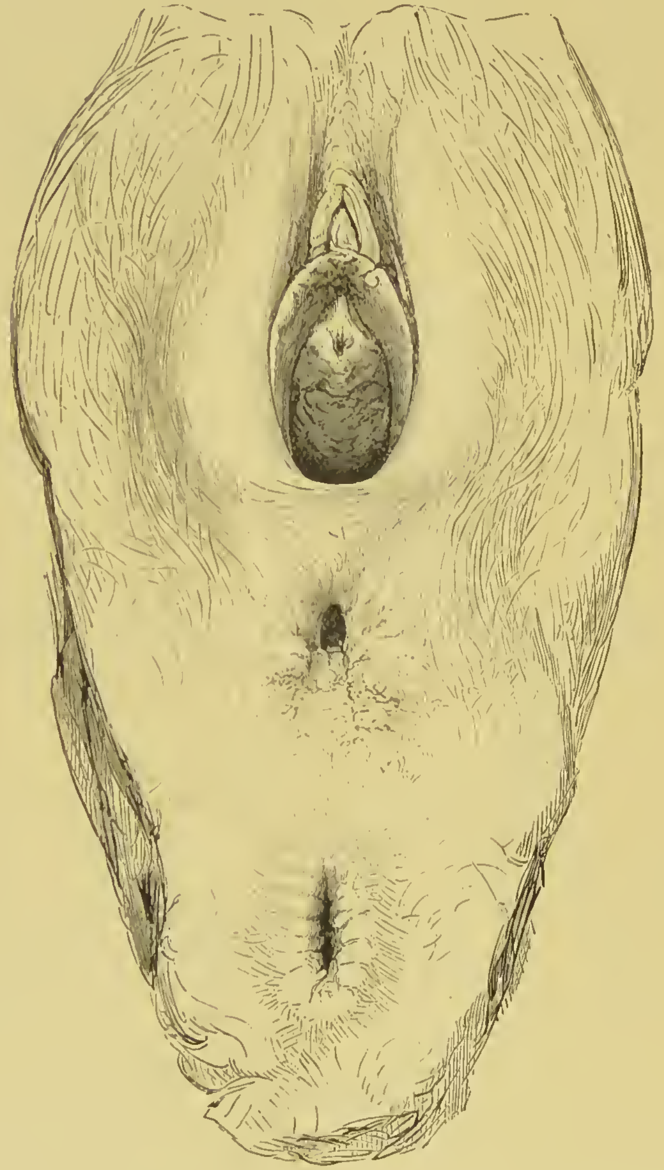

FIG. 296.

CENTRAL RUPTURE OF THE PERINEUM, the child was born not through the Vulva, but through the Ruptured Opening (*Sir J. Y. Simpson*).

sacral segment. An important lesion is the "lateral sulcus tear" this involves the anterior fibres of the levator ani and the gap can be felt by the pressure of the finger.

ETIOLOGY.

The following causes produce rupture in parturition :—

Etiology.

(1) Passage of a large head or of an occipito-posterior rotated into sacrum ; passage of the shoulders ;
(2) Narrowness of pubic arch ;
(3) Straightness of sacrum, as in flat or rickety flat pelvis ;
(4) Syphilitic ulceration ;
(5) Rigidity of parts in elderly primiparæ ;
(6) Careless use of forceps ;
(7) Too early passage of hand into vagina to bring down arms in turning.

Comment on these would lead us too much into Obstetrics.

CLINICAL SIGNIFICANCE.

We recognise here three clinical varieties : (1) perineal rupture, not extensive, but leading to relaxed vaginal orifice and discomfort ; (2) perineal rupture, more extensive than 1, but not involving the sphincter ani ; (3) perineal rupture involving the sphincter ani, and leading to incontinence of fæces.

1. *Perineal rupture, not extensive, but leading to relaxed vaginal orifice and discomfort.* In this case the skin between anus and vaginal entrance may have the appearance of a good perineum as it is said, but when the fingers are passed in, the healed posterior laceration with thinness of the perineal body can be noted. The relaxation and vaginal eversion are evident when the patient bears down. It can be noted too that in the semiprone posture artificial separation of the lips allows the vagina to distend with air. Specially too to be observed is the deficiency at the lateral sulcus vaginæ, where it can be noted that the levator ani is torn. The patient has down-bearing and a feeling of a want of support.

2. *Perineal rupture more extensive than 1, but not involving the sphincter ani.* Here the laceration is more marked, extends further back, and the lateral lacerations are more extensive : it is very often found with prolapsus uteri in varying degree.

3. *Perineal rupture involving the sphincter ani and leading to incontinence of fæces.* This is an important lesion, and from the great discomfort associated with it, imperatively demands operation.

Symptoms. The patient will state that either she has no control over flatus and fæces in the rectum, or that this want of control exists only when she takes a purgative or has diarrhœa.

Physical signs. On examination the anus will be seen, not as a puckered orifice with radiating skin folds all round, but as a crescent, while the anal and rectal mucous membrane will be noted as exposed, and the perineal body completely torn (*v.* Fig. 299). No resistance will be felt as in the normal anus when the finger is inserted.

TREATMENT.

Treatment. We take this up under the following heads:—

a. Prophylactic;
b. Operative, immediate, and deferred.

Prophylactic. *a. Prophylactic.* This properly belongs to midwifery. The obstetrician is too apt to think of the perineum as something that delays the exit of the fœtal head, and to forget the gynecological aspect—that it is part of the supporting segment of the pelvic floor. Extensive tear of this during labour means not only a larger raw surface for septic absorption, but is also one factor predisposing to prolapsus uteri. The question, therefore, of guarding the head during its passage over the perineum is of importance, but belongs to obstetrics. We may note however that the fœtal head, in passing through the outlet, drives the sacral segment back and glides forward in a direction parallel to the driven-back posterior vaginal wall. The normal curve of the sacrum favours this latter motion.

The perineum may tear (1) from over-distension of the orifice; (2) from the too forcible driving of the fœtal head against it, *i.e.*, at right angles to the perineum; (3) from descent of the sinciput owing to fixation of the occiput and thus substitution of the larger diameters of the head for the sub-occipito bregmatic.

Operative. *b. Operative treatment,* (1) immediate and (2) deferred. No practitioner should leave a labour case until he is satisfied, by actual inspection or digital examination, as to the amount of perineal tear. When the sphincter ani is involved, the operation is on no account to be deferred, but must be performed at the conclusion of the third stage. The practitioner should never run the risk of his patient's having incontinence of fæces.

(1) *Immediate operation.* This belongs to obstetrics.

Deferred Operation. (2) *Deferred operation.* This may be to operate on the relaxed and torn vaginal and vulvar orifices, or to repair the torn sphincter and adjacent parts. We therefore consider—

1. Operation for relaxed vaginal outlet,
2. Operation for more extensive perineal tear,
3. Operation for tear involving sphincter ani.

1. *Operation for relaxed vaginal outlet.* We owe this operation in its main points to Emmet, but Kelly has also worked out the subject, and his method, with his excellent diagrams, we follow.

Operation. The bowels have been evacuated by a purgative on the second night before operation, and an enema on the morning of operation. The nurse should see that the enema is completely returned. The patient is placed in the lithotomy posture, and the parts very thoroughly cleansed and shaved. Three points are fixed, two lateral and one mesial, at the most prominent part of the rectocele.

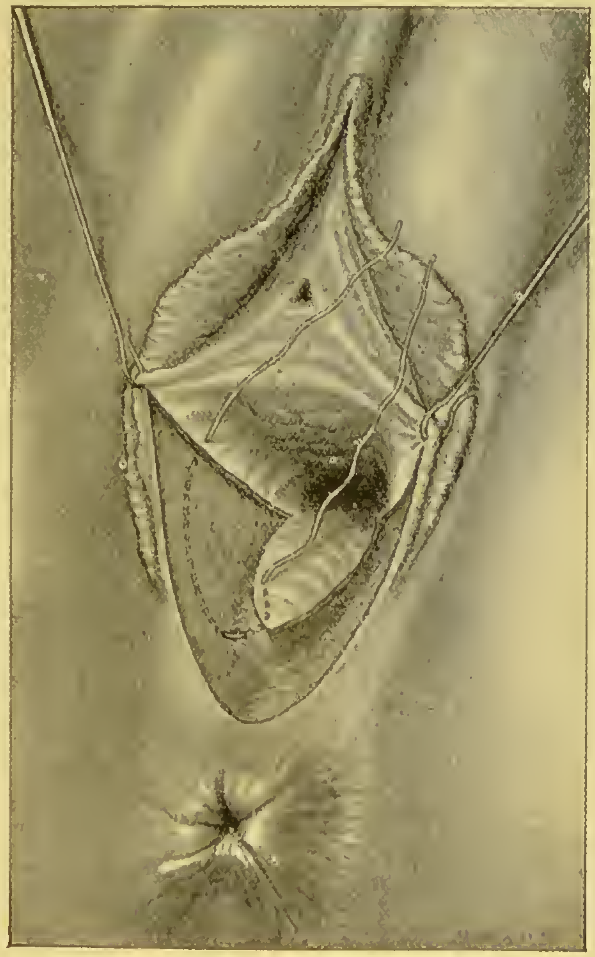

FIG. 297.

KELLY'S OPERATION FOR RELAXED VAGINAL OUTLET (*Kelly*).

One of the silkworm-gut sutures to close in the triangle on the right side is shown. Note that at the bottom of the raw surface the suture crosses and does not pass below it.

The two lateral points are laid hold of with the shepherd's crook tenaculum (*v.* fig. 63, p. 108), those seized being at the remains of the hymen, and such that when brought into approximation in the middle line, the vaginal entrance is sufficiently narrowed (*v.* fig. 297). Thus one sees two triangular surfaces laterally, and the mesial tongue of the crest. This is marked out with a knife, and then the mucous membrane denuded in strips, as in fig. 297, any bleeding being checked by pressure, hot water, or catgut ligature. The edges are brought together with silkworm gut as shown at figs. 297, 298. The mesial tongue is thus slung up to the sides, and probably some muscular union

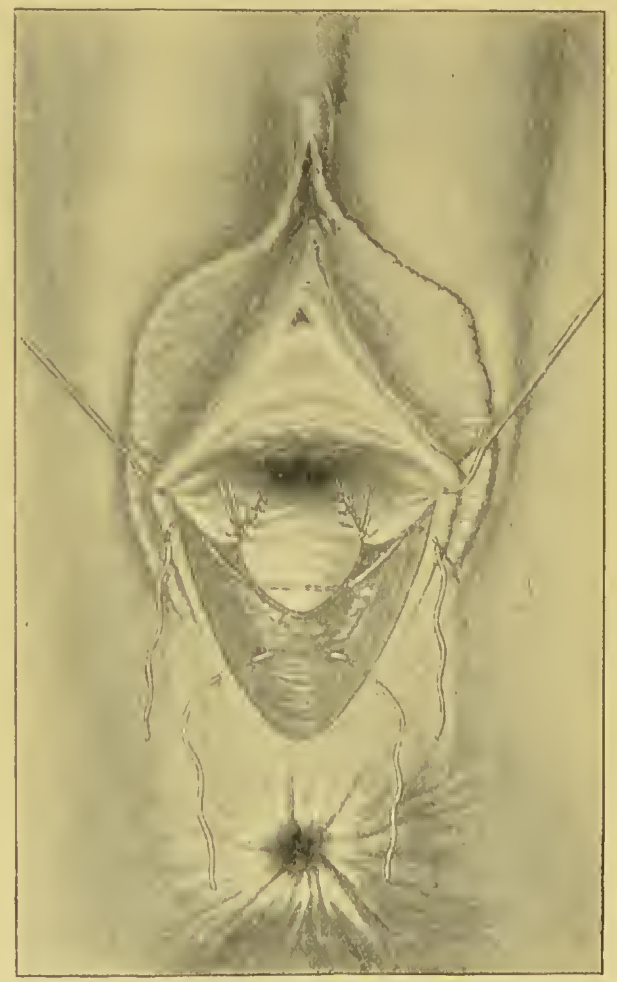

FIG. 298.

KELLY'S OPERATION FOR RELAXED VAGINAL OUTLET (*Kelly*).

The lateral triangles have been closed by sutures. The course of the other two sutures to bring together the remaining raw surface is shown.

obtained. Two other sutures of silkworm gut are introduced to close in the perineum below the mesial tongue.

Emmet was at one time of opinion that he caught up fascia with his stitches, but he afterwards considered that he got muscular union.

2. *Operation for more extensive perineal tear* (considered under Treatment of Prolapsus Uteri).

3. *Operation for tear involving sphincter ani.* In complete tear through the anus, the external sphincter, internal sphincter, and levator ani are torn. Fig. 299 shows this clearly, and also explains what has to be done. What is wanted is not skin union, but some operative measure by which the torn muscular ends can be vivified and united.

The patient's bowels are first freely cleared out by castor oil and enemata so as to ensure that no scybala remain. The nurse should be allowed two or three days for this, and the enemata should be given by means of a long tube, and with the hips elevated.

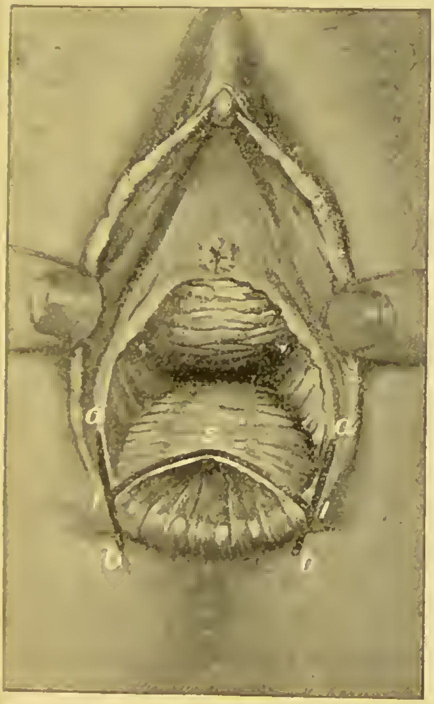

FIG. 299.

COMPLETE TEAR OF PERINEUM PASSING THROUGH SPHINCTER ANI.
For letters and lines of incision see p. 588.

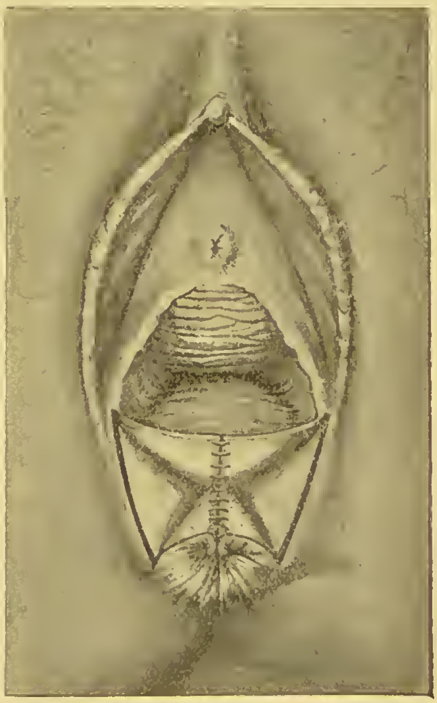

FIG. 300.

SHOWS VAGINAL FLAPS TURNED UP AND STITCHED, ALSO RECTAL WALL AND SPHINCTER.
The sutures to close perineum are not yet introduced.

The instruments requisite are the following:— Requisites.

- Angled scissors,
- Artery forceps,
- Volsellæ or tenacula,
- Catgut and silkworm gut,
- Operating douche,
- Fully curved needles, large and small,
- Needle holder.

The patient is chloroformed and placed opposite a good light in the lithotomy posture. The knees are held by assistants as follows. Each stands facing the light, and places a knee of the patient under the arm-pit next to it; with the hand of the same arm, he controls the patient's foot. With his other hand, the assistant exercises tension on the nates as the operator wishes.

Great care is taken in cleansing the parts and guarding the fingers of the operator from contamination from the rectum. At the same time, strong antiseptics are not employed as a douche, lest absorption take place from the rectal surface. This is best irrigated with boracic lotion, and if necessary a swab (with a string attached) is passed into the bowel to be withdrawn before the sutures are tied.

The parts should first be carefully inspected, and the following conditions noted. (1) The sphincter is represented by a crescent, convexity down, skin wrinkled over it, and two cicatricial dimples show where the ends of the external sphincter lie (fig. 299). (2) On each side above these ends, lie the cicatrised surfaces where the perineal body has been torn. (3) A V-shaped septum separates vagina from anus and rectum, and in its edge lie the internal sphincter fibres (fig. 299). The object of the operation is to unite the ends of the external sphincter, and the edges of the internal sphincter, as well as the torn musculature of the perineal body.

In performing this operation the flap method of A. R. Simpson should be employed, but the flaps should not be made too large as they thus interfere with muscular union; in addition, the ends of the external sphincter should be exposed by the incision, dissected out and united carefully, as will be shown afterwards.

The stages of the operation are—(1) Forming flaps with scissors; (2) applying the stitches.

A. R. Simpson's Operation.

The flaps, as made by A. R. Simpson, are shown in fig. 299. The point of the lower blade of the angled scissors is entered at *b*, pushed over the sphincter ani up to *a*, and then a clip made so as to expose tissue in line *b a*. The point is next entered at 1 on the left side, and pushed between the vaginal and rectal mucous surfaces, *i.e.*, along the loose connective tissue between these until the point emerges at 1 on the right side. A clip is then made so as to expose tissue in the line 1 S 1. Lastly, the point of the scissors is entered at *b* (right side), and *a b* clipped as already done on the left side. In this way an H-shaped figure is cut out (fig. 299). These clipped-out lines map out four flaps which are now to be raised so as to expose for union the muscular tissue lying beneath. The flaps are best raised as follows: Lay hold of flap S 1 *a* (left) at angle 1, with catch forceps, and raise it by clipping: do the same with flap S 1 *a* on right side. While the flap is being raised, the index or middle finger of the left hand is kept on its vaginal aspect so as to regulate its thickness. The rectal flaps S 1 *b* are then treated in the same way, the angle 1 of each being seized with the forceps. In this way a quadrilateral surface is now laid bare (fig. 300), with the muscular ends of the external and internal sphincters as well as the interlacings of the various muscles of the perineal body: fig. 301 will make this clear. The ends of the sphincter externus should be dissected out.

Lawson Tait devised an operation with similar incision, but without dissecting off flaps.

Method of Suturing. At one time silkworm gut was passed from side to side, entering and leaving at the skin surface, and being buried except at the bottom of the wound. The suture at the septum level was however buried as it passed across. Tait passed the sutures in this way, but entering them inside the skin and making them emerge similarly. They thus became buried and more difficult to remove.

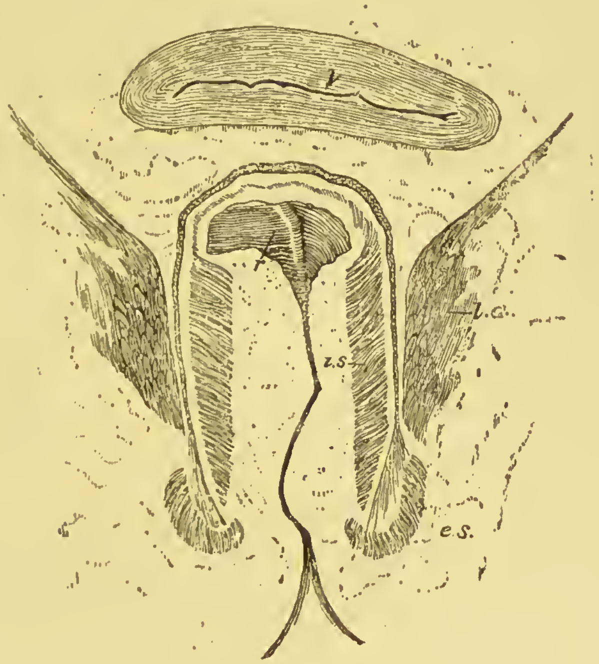

FIG. 301.

CORONAL SECTION THROUGH ANUS (*Symington*).

r, rectum; *i s* internal sphincter; *e s* external sphincter; *l a* levator ani; *v* vagina.

The present method is as follows: The flaps are held apart, irrigated with sterilised water, and all bleeding arrested by hot water or ligatures. The sutures are now passed as follows: (1) A series of interrupted catgut sutures is passed to close in the rectum. They may be passed so as to draw together the muscular wall without passing through the mucosa (fig. 300), in which case they are cut short and buried. If passed through the mucous membrane, they are knotted within the canal. (2) The ends of the external sphincter are brought together by a buried catgut suture (fig. 300), or silkworm gut may be passed from skin to skin, so as to oppose the sphincter ends, but not tied till the other sutures have been placed. (3) The margins of the vaginal flap are adapted by a continuous catgut suture or a series of interrupted ones. The raw surfaces of the perineum are now brought together by a continuous buried catgut suture. For mode of passing this suture *see* figs. 308 and 310. When it has to be finished off the free end is not drawn through, but left long enough to be tied to the loop still in the needle. Deep interrupted silkworm gut sutures, passing through the skin, may be used instead of the continuous catgut. The operator should take especial care to secure union at the apex of the new perineal body. To ensure this the recto-vaginal septum must be split deep enough to produce a good raw surface, and the sutures carefully passed.

Some operators get a similar raw surface, forming it however, by removal of tissue, and not by making flaps. Noble and Kelly have recently recommended a separation of the rectum from the vagina, sufficient to allow of the rectal flaps being drawn down below the level of the anus. The advantage of this is that fæcal extravasation into the new perineal body is prevented.

The only dressing required is to pass a strip of iodoform gauze into the vagina and bring it over the perineal wound. A morphia suppository may be given, and the patient's knees should be tied together after she is put back in bed.

The advantages of the flap method of operating are very great. It can be done very rapidly, ensures muscular union, does not allow skin or mucous membrane to interfere with the union of muscle, and is a great improvement on the old methods. In these the union often seemed sound, but the patient had no additional control from want of muscular union.

This method is not, strictly speaking, that of one operator, but has been evolved as follows: In 1872 John Duncan closed an artificial anus following gangrenous femoral hernia by dissecting up the mucous membrane round the orifice for more than half an inch, invaginating this dissected portion and bringing the raw surfaces together with interrupted catgut sutures: the margins of the skin were then pared and brought together by wire.

Collis, of Dublin, in 1861, in a case of vesico-vaginal fistula split the edges of the fistula instead of paring them. A. Russell Simpson applied the separation of the mucous membrane introduced by Duncan, to tear off the perineum involving the anus, splitting the septum between anus and vagina, and sewing similar mucous membranes to each other as well as bringing the deep raw surfaces into union. This procedure really forms vaginal and rectal flaps. Lawson Tait improved on this by the use of angled scissors, and also introduced the method of passing the sutures inside of the skin instead of through it as formerly done.

The use of scissors to form flaps is also applicable in perineum operations where the anus is not torn. According to Sänger, Stein—a Danish surgeon, and Voss—a Norwegian, have employed somewhat similar methods in complete rupture.

After-treatment. The patient's food must be liquid and not too abundant. The bladder should be emptied by the catheter for the first three days, so as to keep the dressing clean. The bowels are to be confined for three days, and then moved by a small dose of castor oil every second day. Prior to the motion, the nurse must inject a large amount of oil and see that scybala if present are broken down. Unless the nurse is skilled, the operator or his assistant must attend to this. Silkworm gut stitches are removed on the eighth to the fourteenth day.

CHAPTER XLIX.

DISPLACEMENTS OF PELVIC FLOOR: PROLAPSUS UTERI: VAGINAL ENTEROCELE.

LITERATURE.

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Preliminaries. *Preliminary Considerations.* The subject of this chapter can only be understood in the light of an accurate knowledge of the normal structural anatomy of the pelvic floor, and a consideration of the changes it undergoes during parturition, and in the displacements to be considered. Our information on the last point leaves, however, much to be desired. The student should read over Chap. IV.

We note here that the pelvic floor is to be considered as made up of the two portions termed the "entire displaceable" and "entire fixed."

Fig. 295 shows a sagittal mesial section of the pelvis with the "entire displaceable portion" removed and the entire fixed portion left.

These two portions are separated by loose connective tissue, but where the levator ani touches the obturator internus there is a firm union, as we have noted in section of an advanced prolapsus uteri, and in normal pelves. During parturition the child is driven through the vagina, *i.e.*, through the pelvic floor, which becomes canalised or opened up through this process. If we regard this process only in sagittal mesial section as shown in Braune's plate, we see that the pubic segment is drawn up and the sacral one driven down and back, and the vagina in addition greatly distended. If considered in axial coronal section we should see the "entire displaceable portion" in part drawn up, the fœtus driven through it and thus the levatores ani and glutei muscles in the "entire fixed portion" driven out and back and the former sometimes torn (*Schatz*) or at any rate elongated, and their slope diminished. The slit in the triangular ligament through which the vagina passes is also dilated, and may be unduly so. The upward traction exercised on the "entire displaceable portion" necessarily elongates or slackens the loose connective tissue joining the two portions and is one factor in bringing about prolapsus uteri. As the result therefore of the structure of the pelvic floor, of lesions caused by parturition, and intra-abdominal pressure, we may get certain conditions, viz.,

I. Undue yielding or bulge of the pelvic floor;
II. Prolapse of the "entire displaceable portion" with the uterus and abdominal viscera, in part, past the "entire fixed portion"—so-called prolapsus uteri;
III. Vaginal enterocele,—anterior and posterior.

1. *Undue yielding or bulge of the whole pelvic floor.* This is a condition to which attention has been drawn by Herman and Skene. Our knowledge of this lesion is however very defective and calls for investigation. In undue bulging of the pelvic floor, the normal pelvic floor projection is increased. Herman measures with a tape the length of the arc described by the curved skin aspect of the pelvic floor between tip of coccyx and lower margin of symphysis pubis. This average, about four inches, may be increased by straining, in virgin cases, to four and a half inches; but in cases of undue bulge, to about six or more.

Causation. This lesion is due to parturition; we are not yet in a position to give precise details, owing to the complete want of sectional and dissectional work on the pelves of women with such a prolapsed condition. Schatz and Skene have described certain conditions of laceration of the levater ani muscles, atrophy and permanent paralysis, but all descriptions have been based on clinical investigation uncorrected by anatomical examination. The subject however is important, the researches so far suggestive, and further accurate work called for.

The *Symptoms* of undue yielding are bearing-down pain with dragging in loins and hips.

The *Treatment* is the use of an abdominal belt with a perineal band.

PROLAPSUS UTERI.

DEFINITION.

A downward displacement of entire displaceable portion of pelvic floor, uterus and appendages, past entire fixed portion; with coincident descent of small intestine.

PRELIMINARIES.

The subject of Prolapsus Uteri is a complex one, and has been in part made so by erroneous terminology.

Thus the well-known term Prolapsus Uteri has biassed many observers as to the nature of this lesion, inasmuch as they have considered some change in the uterus as initiating the prolapse. This is a natural error, and is perpetuated in most of our text-books by the writers of these considering prolapsus uteri under affections of the uterus. Prolapsus uteri is, however, considered here under Displacements of the Pelvic Floor, as it is really a hernial displacement of part of the pelvic floor in which the entire displaceable segment of the pelvic floor, uterus, and appendages are driven down by intra-abdominal pressure. There is no doubt that some change takes place in the length of the uterus as the result of the downward displacement. This change is, however, a secondary one, as will presently be explained, and does not initiate the lesion.

The student must therefore use the term prolapsus uteri not in its literal sense, but as equivalent to "sacro-pubic hernia."

Prolapsus uteri is sometimes applied to hypertrophy of the vaginal portion of the cervix. This is wrong, as this hypertrophy is a growth phenomenon.

ETIOLOGY.

The factors producing prolapsus uteri are three in number:—(1) *Deficient support by entire fixed portion;* (2) *Deficient tone of entire displaceable segment of pelvic floor, and slackening of loose tissue round it;* (3) *Intra-abdominal pressure.*

Deficient support by entire fixed portion. By this is meant that through parturition the sacral segment has become straightened out or deficient at its lower margin—the perineum—and that the slope of the levatores ani has been lessened or that they have been torn (Schatz). It is wrong to imagine that tear of the perineum is everything in prolapsus uteri; the perineum may be considerably torn and yet, if the sacral segment is still sufficiently curved and the intra-abdominal pressure not too great there will be no prolapsus. Tear of the perineum diminishes the sacral support, and deficient sacral and levator-ani support makes the task of intra-abdominal pressure easier.

The bearing of the *second* and *third* factors is sufficiently evident. Of all the three, increased intra-abdominal pressure is the most important and is sufficient to cause prolapsus in virgins. The first and second are adjuvant.

NATURE.

Prolapsus Uteri a Hernia.

The uterus has nothing to do with prolapsus. It is a classical term, but a misleading one. Prolapsus uteri is really *a hernia*; and is analogous in every point to what we term a surgical hernia (such as inguinal hernia).

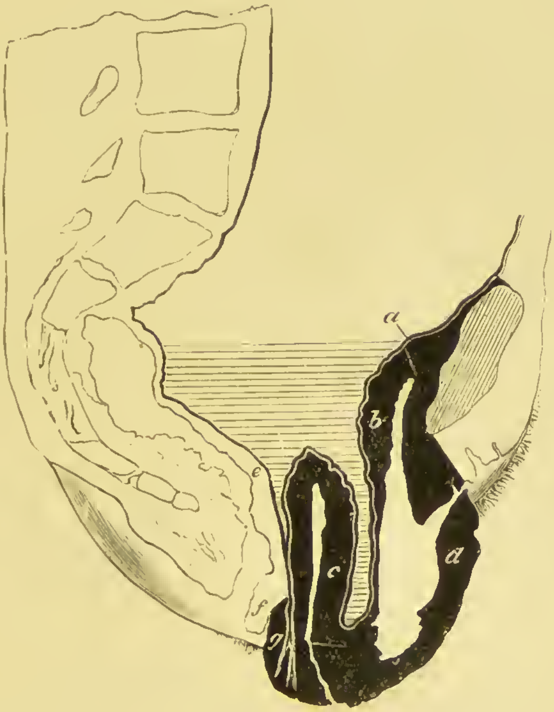

FIG 302.

TO SHOW THE HERNIAL NATURE OF PROLAPSUS UTERI; *a* peritoneum; *b* bladder; *c* uterus; *d* anterior vaginal wall; *e* anterior rectal wall; *f* perineum; *g* posterior vaginal wall. The dark portions are the coverings of the Hernia (after *Schütz*).

Thus it has (1) a sac, the peritoneum; (2) a definite road to travel along, whose boundaries are—*a.* in front, the symphysis pubis, *b.* behind, the portion of the sacral segment of the pelvic floor from anterior wall of rectum back to sacrum, *c.* side walls, viz., obturator internus and levator ani muscles; (3) definite coverings, viz., *a.* pubic segment of pelvic floor, *b.* the uterus, *c.* posterior vaginal wall. Like many herniæ, its sac contains small intestine (fig. 302).

Huguier's Views.

Huguier alleged wrongly we believe, that, by a hypertrophic elongation of the supra-vaginal portion of the cervix, the bladder and posterior vaginal wall were displaced downwards; and that many cases of alleged prolapsus uteri are really due to this. Such cases differ from prolapsus uteri in the fact that the fundus uteri and fundus of bladder are in position. Many gynecologists hold this view of Huguier, most of them modifying it somewhat. Schroeder's Handbook, Goodell's Gynecology, and Hart's Structural Anatomy may be consulted on this moot point.

SYMPTOMS AND PHYSICAL SIGNS.

The discomfort caused by the protrusion and the excoriation of the parts is the prominent symptom. The patient complains of "something coming down in front." Further, there may be difficulty in micturition.

The physical signs are distinct. If the prolapsus be *incomplete*, a portion of the anterior vaginal wall has passed out at the vaginal orifice, the os uteri is equally displaced downwards, and the posterior fornix is apparently deeper from the descent of the cervix. The uterus, in addition to being low down, is usually enlarged; it lies with its axis coinciding with that part of the pelvic curve in which it is. If the prolapsus be *complete*, we find the whole anterior vaginal wall outside the vulva, the cervix extruded, and the posterior vaginal wall everted (fig. 160). The student must specially note that this description is based on *clinical* observation.

From the *study of frozen sections*, we further learn that the posterior vaginal and anterior rectal walls are separated by peritoneum driven in between them, and that the uterus with other parts has become hypertrophied through long-standing congestion, and the cervix elongated.

MECHANISM OF PROLAPSUS.

The displaced organs can be replaced—posterior vaginal wall first, then uterus, and lastly pubic segment; on the patient's straining, the mechanism of the displacement is repeated, is seen to be perfectly definite and to occur as follows.

Mechanism on Clinical Observation.

We have first the appearance of the anterior vaginal wall, from below upwards, at the orifice. *Pari passu* with its descent, the uterus and posterior vaginal wall have come down; the cervix tracing out the pelvic curve, while the uterus becomes more and more inclined backwards, until at the vaginal orifice it lies in the vaginal axis; the posterior vaginal wall forms a pouch, the depth of half its own length, behind it. Finally, the uterus is driven outside; the cervix sweeps upwards and forwards, and the posterior vaginal wall is now completely everted—its lowest part appearing last.

Appearance of Prolapsus on Section.

On vertical section, we now find these conditions: (1) Almost complete extrusion of the anterior or pubic part of the floor, the upper and anterior part of the bladder still behind the symphysis; (2) Complete extrusion of the uterus, which sometimes lies with the fundus below the level of the anus; (3) Rectum in position and only posterior vaginal wall down; the latter has peeled from the rectum downwards as far as the lowest inch-and-a-half (of close connection) which is elongated (fig. 302).

Explanation of Mechanism.

The *explanation of this mechanism* is as follows. The displacement in prolapsus uteri is caused by intra-abdominal pressure, pushing down that part of the pelvic floor which lies in front of the anterior rectal wall, and inside the obturator internus and upper portion of the levator ani muscles. This part consists of entire displaceable portion of pelvic floor, with uterus and appendages. If we now look at a section of the pelvis such as is seen in Pl. II. (vertical mesial section) we find the posterior angle of the pubic segment is attached to the cervix uteri, and the cervix uteri to the top of the posterior vaginal wall. Thus, if intra-abdominal pressure is excessive, this part when driven down must have the following sequence of protrusion at the vaginal orifice: (*a*) Anterior vaginal wall from below up; (*b*) Cervix uteri; (*c*) Posterior vaginal wall from above downwards.

Our knowledge of the side relations in prolapsus is not yet complete, but from the structure of the normal pelvis and the study of a section of advanced prolapsus uteri by Symington, we believe that separation takes place inside the obturator internus and upper portion of the levator ani muscles (*v.* Chap. IV.). At the junction of the levator ani and obturator internus there is a special union, so that the lateral displacement in prolapsus uteri is less than that seen in sagittal mesial section.

The uterus, while it is being forced down, has the *direction of its long axis* continually altering. This is often expressed by saying that the uterus becomes more and more retroverted, as it is forced down. The real fact is, that, as the pubic segment is forced down, it is stretched—chiefly on its perineal aspect. In this way tension is made on the cervix uteri, with the effect of throwing the fundus back and making it rest on the retrojacent structures. As these have (roughly speaking) the pelvic curve, we get the uterus in this way constantly altering the lie of its axis.

The *enlargement* is not purely cervical, but affects the whole uterus, the pubic segment, and the posterior vaginal wall. This enlargement is a *consequence* of prolapsus uteri, and not a factor in its production. If we view a prolapsed uterus (with the os at the ostium vaginæ) through the pelvic brim, it can be seen that it lies, as it were, at the bottom of a valley—the sides of the valley being the broad ligaments, the bed of the valley the uterus. The parts of the uterus do not lie on the same horizontal plane, the cervix lies low. It is thus probable that the venous supply of the uterus, having a mechanical disadvantage to its return may have a tendency to stasis. This may lead to areolar hyperplasia at first, and, so far as our present knowledge goes, partly accounts for the increased size of the uterus in prolapsus. There is further probably a tensile elongation of the cervix produced which increases the uterine length.

SUMMARY OF DISPLACEMENT IN PROLAPSUS.

I. On clinical observation while a complete prolapsus is being reproduced by the straining of the patient, we note—

(*a*) The anterior vaginal wall from below upwards passing down and out at the vaginal orifice;
(*b*) The cervix uteri appearing at the vaginal orifice;
(*c*) The posterior vaginal wall, from above down, coming last.

II. If a frozen section of a cadaver with prolapsus uteri be examined (fig. 302), we note that the pubic segment, uterus and posterior vaginal wall are displaced down and out. Fig. 302 is based on Schütz's drawing of such a frozen section. Axial coronal sections have not as yet been published, but the ureters are displaced down along with the bladder, and through being pressed on by the pubic arch may give rise to uræmia, as in a case recorded by A. E. Barker of University College, London.

III. The combined study of I. and II. shows that

> The bladder and uterus are displaced down, the vagina everted or turned inside out, the small intestine coincidently lowered in the pelvis, the displaced parts congested and hypertrophied, and the cervix uteri elongated secondarily, owing, it is alleged, to the ductility of its supra-vaginal portion.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

The diagnosis is made by noticing the relation of the parts extruded, and by passing the sound if necessary into the bladder and uterus.

The differential diagnosis must be made from the following conditions:—

(1.) *Hypertrophy of the vaginal portion of the cervix*;
(2.) *Hypertrophy of the supra-vaginal portion of the cervix.*

For both of these conditions the student is referred back to page 305 (*see* figs. 152, 158, 159).

(3.) *Cystocele.* Uterus is in position, and displacement is found to be due to bulging back of posterior wall of bladder.

(4.) *Rectocele.* The finger, passed through the anus, can be pushed into the pouched rectum.

(5.) *Inversion and polypus* (*v.* p. 403).

TREATMENT.

A. Treatment by pessaries,
B. Treatment by operation.

A. Treatment by pessaries. In slight cases, where the anterior vaginal wall protrudes only a little, we may use an Albert Smith or Hodge pessary, with or without transverse bars at the lower part. If this fails, a ring pessary with spring inside should be tried; this instrument is useful here, inasmuch as it is shorter vertically than the Albert Smith and therefore does not project over the lower end of the shortened posterior vaginal wall. The instrument may be made of vulcanite, block tin, or india-rubber. The india-rubber forms are best, and may be provided with a perforated diaphragm, but this tends to retain discharge.

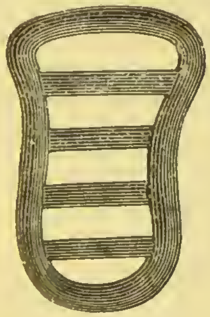

FIG. 303.

GREENHALGH'S PESSARY, with transverse bars.

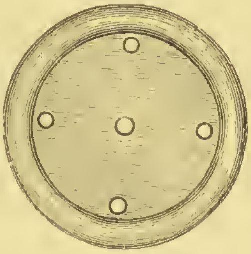

FIG. 304.

RING PESSARY, with diaphragm.

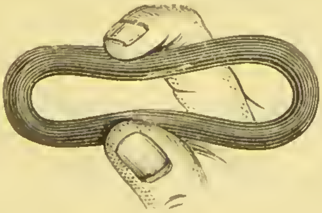

FIG. 305.

SIMPLE ELASTIC RING PESSARY, compressed between the fingers for introduction (*De Sinéty*).

The pessary is taken in the right hand, and compressed between the finger and thumb as in fig. 305 while it is being passed through the vaginal orifice; the labia are separated with the fingers of the left hand.

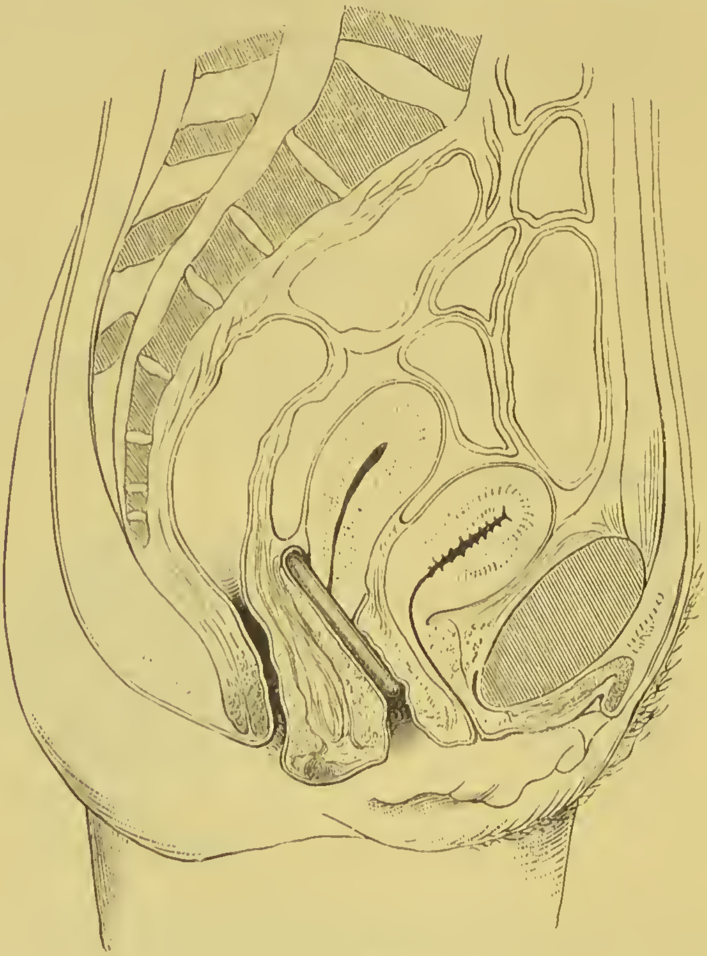

Fig. 306.

Ring Pessary *in situ* (*Hart*).

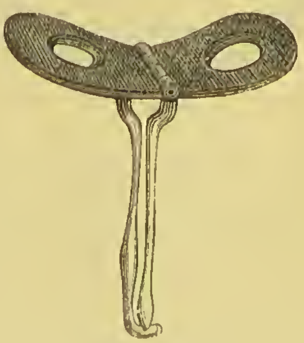

Fig. 307.

Zwanck's Pessary for prolapsus.

If the ring instrument fail, then others may be tried, if operation is considered unadvisable. Fig. 307 shows Zwanck's pessary, a bad form. In very bad cases and in old women where an operation is out of the question, Barnes' cup-and-stem pessary with abdominal belt for attachment may be used, and if attended to is satisfactory so far. Among the very poor, the patient or her friends should be instructed how to pack the vagina with marine lint; the packing, if thorough, may remain *in situ* for a week. When there is much congestion and excoriation, rest in bed with the use of alum injections (ʒi to Oi) and application of boracic or zinc ointments to the raw surfaces, are indicated.

It is remarkable how much even an advanced prolapsus uteri can be benefited prior to operation by rest in bed, and the use of the vaginal tampons for a few weeks.

If the patient has good abdominal development, an abdominal belt will be of use; when applied, it should be fairly tight at the lower edge and slack at the upper one.

B. Treatment by operation. We must first consider the *status quo* in an advanced prolapsus. There are the following primary and secondary lesions.

Condition of Parts in Prolapsus Uteri.

Primary
- (1) Perineal body usually torn and perineal union of levatores ani, transversi perinei, and bulbo-cavernosi, torn to a greater or less extent;
- (2) Increase of intra-abdominal pressure;

Secondary
- (3) Congestion with areolar hyperplasia of uterus, pubic segment, and posterior vaginal wall; laxity of everted vagina;
- (4) Separation of anterior rectal and posterior vaginal walls and of vagina and bladder from their lateral relations, with peritoneum clothing the separated surfaces.

These secondary lesions, especially the last, are serious. In order to restore the pelvic floor to its pristine state we should require (1) to repair the perineal body and narrow the vagina; (2) to restrain increased abdominal pressure; these are possible: (3) to do away with congestion and areolar hyperplasia is probably beyond our powers, while (4) to bring about adhesion of the anterior rectal and posterior vaginal walls and to restore the lateral supports is impossible. *Prolapsus uteri is therefore a condition with serious secondary results.*

OPERATIVE TREATMENT OF PROLAPSUS UTERI.

For operative purposes we consider prolapsus uteri as a downward and outward displacement of the entire displaceable portion of the pelvic floor past the entire fixed portion, with eversion of the vaginal walls.

The various operations may be classified as follows :—

1. Those that aim at causing a narrowing of the vaginal walls or bringing about their partial union, so that they are less easily everted (Colporraphy) ;

2. Those that aim at giving a support to the prolapsed portions by repairing the lower edges of the sacral segment (Perineorraphy) and uniting the lower edges of the labia majora (Episio-perineorraphy) ;

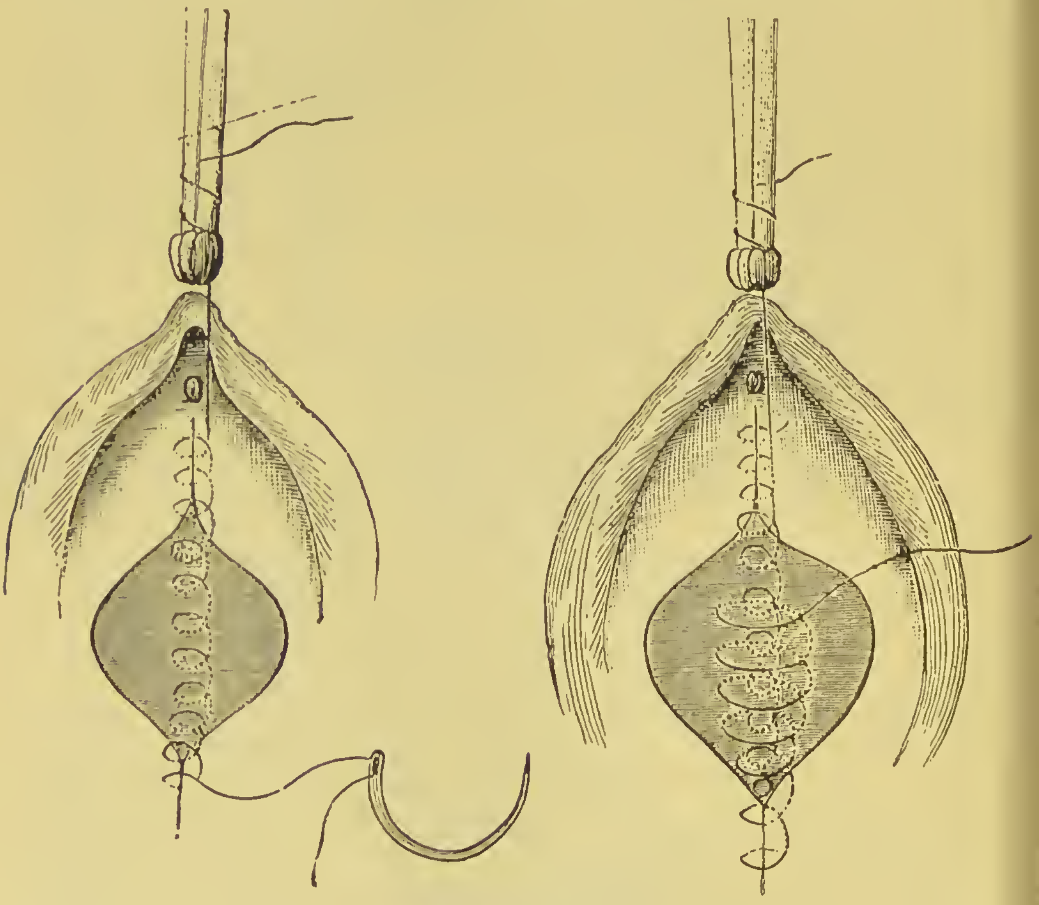

FIG. 308.

CONTINUOUS CATGUT SUTURE IN ANTERIOR COLPORRAPHY (*Pozzi*).

1. In two stages. The first has been completed, and brings together the mucosa at the angles of the wound, the raw surface only in its centre ; the second stage will unite the mucosa throughout.
2. In three stages. Here two have been used to contract the raw surface, while the third will close in the mucosa throughout.

3. The special operations which draw up the entire displaceable portion by shortening the round ligaments of the uterus (Alexander-Adams' Operation) and ventral fixation of the uterus.

After rest in bed, the use for a week or so of ichthyol tampons, and attention to the healing of any excoriations, the following operations may be performed :—

Operations for Prolapsus.

1. In a case where the prolapse is marked so that the cervix uteri projects beyond the vulva, it will probably be best to amputate part of the cervix, perform an anterior and posterior colporraphy, and restore the perineum. Amputation of the cervix has been already described at p. 305.

Anterior Colporraphy. This is not always necessary, but should be performed when the cystocele part of the prolapsus is redundant.

After all preliminary cleansing procedures as already described, with the patient in the lithotomy posture, both lips of the cervix are laid hold of with volsellæ, and the uterus drawn down outside the vulva. Should the anterior colporraphy have been preceded by amputation of the cervix, the cervical stump can be drawn down by two of the sutures left long for the purpose. Laterally, and near the urethral orifice, the vaginal mucosa is laid hold of with volsellæ, and a tense quadrilateral surface thus mapped out.

A vertical mesial incision is now made over this surface with a knife through the mucous membrane to the separable submucous layer. The edges of the incision are laid hold of, and, partly by gentle pressure with a swab, partly with the ball of the fingers, or with scissors when the loose plane is evident, the mucous membrane is stripped back to near the volsellar grip and the raised flaps cut off (fig. 308). With a continuous suture of catgut the raw surfaces are brought together, first on each side of the middle line, then lateral to this, and finally the edges of the original vertical incision are united in the same way (fig. 308).

Posterior colporraphy is done in the same way, but is not so often necessary.

Some operators denude the strips laterally, leaving the vaginal mucous membrane in front and behind 1½ inches wide. The edges at the side are then sewn together, and the vaginal calibre diminished (Edebohls).

2. *Perineorraphy.* This can be done by the flap method as follows, and is a useful operation.

The patient is placed in the lithotomy posture, and all the usual cleansing precautions taken. The operator then marks out with a knife a U-shaped line on the parts (fig. 309). The transverse part of the U runs between the anus below and the posterior aspect of the vaginal entrance, while the top of the vertical limbs runs up to the level of the lower ends of the labia minora. With sharp-pointed angled scissors the flap so mapped out is raised as follows. One blade of the scissors is entered on the left side at the junction of the vertical and transverse limbs, pushed transversely to the opposite angle and then a clip made. The same is done to the vertical limbs. The flap is then laid hold of with forceps, and, partly by clipping, partly by pressure of the finger, raised up. Thus a raw surface is made, and its lateral aspects drawn together by continuous suture as follows. The flap is held up, exposing the raw surface (fig. 310). One begins the continuous suture above, and passes down so that two tiers, sometimes three, are used to bring the lateral surfaces together (fig. 310). The skin edges can then be approximated with silkworm-gut interrupted sutures, or the continuous suture may be employed

Care must be taken to approximate the edges at the vaginal entrance, otherwise the wound may become infected.

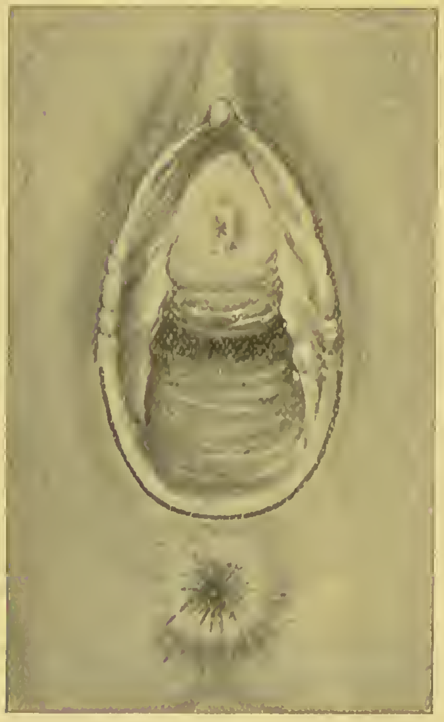

FIG. 309.

LINES OF INCISION IN OPERATION FOR REPAIR OF RUPTURED PERINEUM.

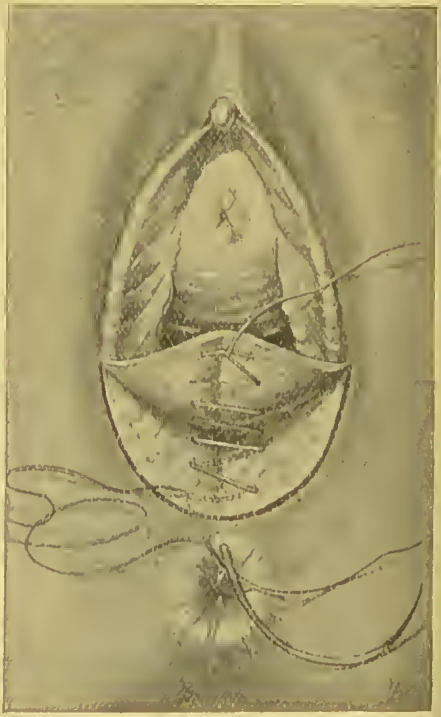

FIG. 310.

CONTINUOUS SUTURE PASSED IN SAME OPERATION.

After-treatment. The parts are carefully cleansed after operation, and a piece of iodoform gauze, with its upper end in the vaginal entrance, laid over the wound. The catheter should be used for a day or two, and the parts externally cleansed after its use, but the nurse must take care to disturb them as little as possible.

Instead of this flap operation, some operators make a raw surface over the perineum and lower end of the vagina. The lateral surfaces are then approximated as in the flap operation. Of course if this operation fails there is less tissue to operate on again, whereas the flap operation removes no tissue.

3. *The special operations which aim at drawing up the entire displaceable segment and uterus by shortening the round ligaments* (*Aran, Freund, Rivington, Alexander-Adams' Operation*), *and ventral fixation.*

Shortening of the round ligaments, first proposed by Alquié of Montpellier, and brought into prominence by Alexander of Liverpool and Adams of Glasgow, aims at shortening the round ligaments and fixing them in the inguinal canal so as to draw up and fix the displaced parts. It has been described under the operative treatment of retroversion (*v.* p. 392, and Pl. X., fig. 5). When the operation is undertaken for prolapse, perineorraphy and colporraphy are, in most cases, first done.

The results from Alexander-Adams' operation are less satisfactory in prolapse than in retroversion.

Ventral fixation is sometimes employed, and has given satisfactory results when combined with plastic operations on perineum and vagina.

We recommend in treatment—

(1) Use of a ring in slight cases;
(2) Episio-perineorraphy or Colporraphy, anterior and posterior, and amputation of the cervix in cases calling for operation.

Alexander-Adams' operation, and especially ventral fixation, are more serious operations than those which aim simply at restoring the pelvic floor; they must therefore be reserved for those cases in which the latter alone are insufficient to cure the prolapse.

Recently some new and more extensive operations have been performed—viz., shortening of the utero-sacral folds through the abdomen; removal of the uterus and vaginal walls. These are, however, as yet *sub lite* as to their results, and we merely mention them at present.

In bad cases the uterus may be excised, and a plastic perineal and vaginal operation performed afterwards.

The use of massage in prolapsus uteri will be described in the Appendix.

VAGINAL ENTEROCELE.

Of this there are two forms—*anterior* and *posterior*. Excessive intra-abdominal pressure usually displaces all of the pelvic floor that lies in front of the anterior rectal wall. Occasionally, but very rarely, intestine is forced down between the posterior aspect of the bladder and upper part of anterior vaginal wall, or between the anterior rectal and posterior vaginal walls (fig. 311). We thus get a mass bulging into the vagina, but affecting only one wall; the uterus and cervix remain in position. This distinguishes it from prolapsus uteri and cervical elongation; by rectal examination the posterior form of *enterocele* can be distinguished from rectocele.

The *causation* is not well known. In the posterior form a deep dip of the peritoneum behind the posterior vaginal wall may have existed; but of this there is no evidence.

Treatment. If an Albert Smith or such pessaries as are shown in figs. 303 and 304 fail, an operation may be tried. In the posterior vaginal enterocele, for example, the protrusion should be replaced; a raw surface is then made on the posterior lip of the cervix and on a portion of the posterior vaginal wall about its middle; these surfaces are then stitched.

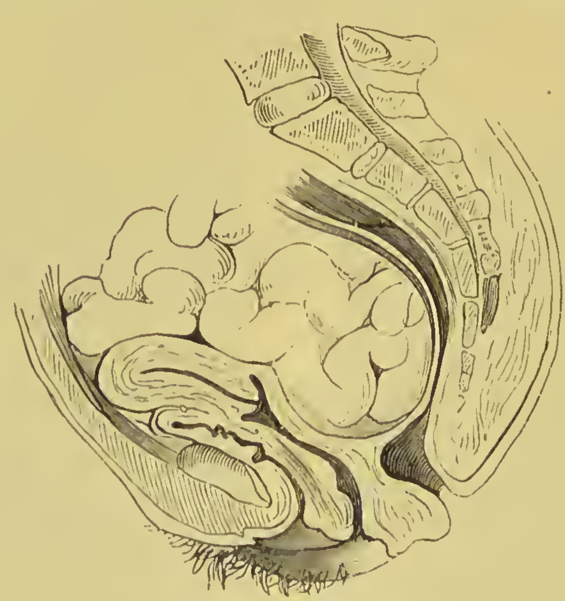

FIG. 311.
POSTERIOR VAGINAL ENTEROCELE (*Breisky*).

Prolapsus uteri and both forms of vaginal enterocele are therefore essentially the same in nature—viz., hernial. Intra-abdominal pressure usually displaces all in front of the anterior rectal wall; but may also force intestine in front of the anterior vaginal wall or behind the posterior one.

SECTION VIII.

DISTURBANCES OF THE MENSTRUAL FUNCTION.

CHAPTER L. Amenorrhœa: Menorrhagia: Dysmenorrhœa.

SECTION IX.

DISTURBANCE OF THE REPRODUCTIVE FUNCTION.

CHAPTER LI. Sterility.

CHAPTER L.

AMENORRHŒA: MENORRHAGIA: DYSMENORRHŒA.

The three subjects to which this section is devoted are not diseases, but are symptoms of a large number of the more or less well-ascertained pathological conditions already considered. Theoretically, therefore, they should not come up for special consideration; practically, however, it is of use to the practitioner to summarise the conditions causing these symptoms, and to give some special hints as to their treatment.

AMENORRHŒA.

This means cessation of menstruation during the period between puberty and the menopause. It is normal to have Amenorrhœa during pregnancy and lactation. Amenorrhœa may be caused by the following *Local* conditions:—

Causes.

Congenital . . .	Absence or incomplete development of uterus and annexa, atresia of the genital canal (with or without accumulation of the menstrual blood), state of cretinism;
Acquired	Superinvolution, simple atrophy of uterus, cystic ovarian disease, extensive inflammatory conditions of uterus and ovaries, morphinism.

Constitutional conditions—such as phthisis, chlorosis, prematurity of menopause—also cause amenorrhœa.

The local conditions have already been fully described under the various heads; we give here only a few hints as to the investigation of the causes of this symptom. When the patient complains of *never having menstruated* and there is no constitutional cause for the amenorrhœa, the question of examination should always be entertained; abdominal palpation and rectal examination are employed to ascertain that there is no retention from atresia. To ascertain the condition of the uterus a vaginal examination may be necessary. *Sudden cessation* of menstruation in a woman neither phthisical nor chlorotic is usually due to pregnancy; early sickness, mammary and other signs should be looked for. The surest sign of pregnancy in the early months is the characteristic increase in the size of the uterus, agreeing with the number of periods passed.

Treatment.

In cases where amenorrhœa is due to chlorosis, Blaud's pills are indicated. These contain sulphate of iron and carbonate of potash made up as undernoted; as the result of the combination, the carbonate of iron is formed.

℞	Ferri sulphatis	
	Potassi carbonatis	āā gr. iiss.
	Mucilaginis tragacanthæ	q.s.

Fiat pilula: mitte tales 96.
Sig. Three, thrice daily.

Nine pills must be taken per diem continuously for six to eight weeks, by which time a complete cure usually results.

Before the pills are given, the state of the tongue and bowels should be looked to. If the tongue is foul and the bowels constipated, we may give the following:—

℞	Magnesii sulphatis	℥i.
	Quinine sulphatis	gr. xxiv.
	Acidi sulphurici dil.	ʒiij.
	Aquam ad	℥vi.

Sig. Tablespoonful twice or thrice daily.

This is taken for a week. The Carlsbad salts or Friedrichshall water may be substituted. This hint as to the preliminary purgation is a good one, and is given by Milner Fothergill; if not attended to, the result will be disappointing as the iron will not be so readily absorbed by the intestinal mucous membranes.

Ringer recommends permanganate of potash. The following is a good formula:

℞	Potassii permanganatis.	
	Kaolin āā	gr. ij.
	Vaselini	q.s.

Fiat pilula: mitte tales xxiv.
Sig. One thrice daily.

These pills should not be made with any excipient containing glycerine or with an oxidisable substance as their union would cause combustion.

Oxide of manganese (manganesii oxidum præparatum) in two grain doses thrice daily is also excellent.

MENORRHAGIA.

Menorrhagia is the term applied to excessive hæmorrhage at the menstrual periods; when the hæmorrhage is intermenstrual, it is termed metrorrhagia.

The causes of menorrhagia are the following:—

Causes.

Constitutional .	Hæmorrhagic diathesis, scorbutic conditions, alcoholism;
Local	Ovaritis, small cystic ovaries, endometritis, metritis, subinvolution, retroversion of uterus, inversion of uterus, submucous and interstitial fibroids, polypi, carcinoma uteri, sarcoma uteri, incomplete abortion.

It should not be forgotten that we may have menorrhagia in cardiac disease, and also in hepatic congestion (*Matthews Duncan, Warner*).

Women who are drunkards very often suffer from menorrhagia owing to the liver congestion. This may give the practitioner a hint as to the patient's habits, especially as women who drink always conceal the failing, and often most successfully. When called to such, there is usually found great epigastric pain on pressure, tremulous tongue, and depression of spirits, for which their excuses are quite inadequate.

Treatment. The treatment of menorrhagia is the treatment of the condition producing it. In cardiac disease we give digitalis; and in hepatic disease we may try chloride of ammonium, euonymin or iridin.

℞	Ammonii chloridi	ʒiij.
	Aquæ	℥vj.

Sig. Tablespoonful thrice daily.

℞	Euonymin	
	vel	
	Iridin	gr. ii.
	Pil. aloes et ferri	q.s.

Fiat pilula: mitte tales xij.
Sig. One at night.

In cases where there is menorrhagia due to a simple congested condition or to a flabby state of the uterine muscle, we may give the following at the menstrual periods:—

℞	Ergotini	gr. iv.
	Argenti oxidi	gr. $\frac{1}{4}$
	Micae panis	q.s.

Fiat pilula: mitte tales xij.
Sig. One thrice daily as directed.

Note that it is well not to write "at the menstrual period" on the prescription, but to put "as directed." When the practitioner is consulted as to menorrhagia in unmarried women or young girls, he should first try ergotin. If this fail and the case be urgent, he should request a local examination. If this be declined, the responsibility rests with the patient.

℞ Extract ergotæ liquidi ℥ij.
Sig. Thirty drops as directed.
or
℞ Ergotini gr. iv.
Fiat suppositorium : mitte tales xij.
Sig. As directed.

Inform the patient that two suppositories are to be passed into the rectum each morning after the bowels move.

In some cases the hypodermic injection is required.

The vaginal tampon may be necessary in certain cases of severe menorrhagia until more radical treatment can be adopted.

DYSMENORRHŒA.

LITERATURE. *Champneys, F. H.*—On Painful Menstruation : London, H. K. Lewis, 1891. *Croom, J. Halliday*—Disorders of Menstruation : Clifford Allbutt and Playfair's System of Gynecology, London, 1896. *Duncan, Matthews*—Clinical Lectures : London, 1886, p. 141. *Goodell*—Lessons in Gynecology : Philadelphia, 1879. *Gusserow*—Menstruation and Dysmenorrhœa: Germ. Clin. Lect., New Syd., Soc. Tr., 1877. *Herman, G. E.*—On the Relation between backward Displacements of the Uterus and Painful Menstruation : Lond. Obst. Trans., 1882. *Solowieff*—Decidua menstrualis : Archiv f. Gyn., Bd. ii., S. 66. *Schroeder*—Die Krankheiten der weiblichen Geschlechtsorgane : Leipzig, 1887. *Simpson, Sir J. Y.*—Diseases of Women, p. 225 : Edin. 1872. *Williams, John*—Pathology and Treatment of Membranous Dysmenorrhœa : Lond. Obst. Tr., 1877.

Dysmenorrhœa may be defined as the occurrence of pain before, during, or after the menstrual period.

The pain of dysmenorrhœa varies greatly in intensity. It may be so severe as to render the sufferer a miserable invalid, it may interfere with her work more or less, or it may cause only marked uneasiness. It is always advisable in cases of dysmenorrhœa to ascertain how much the pain interferes with the patient's occupation or whether it confines her to bed. Note also when the pain occurs—prior to, during, or after the blood-flow ; in the purely spasmodic form, it is during the flow.

In order to treat dysmenorrhœa intelligently, we must endeavour to ascertain its cause and try to make out how this condition brings about the pain. We know nothing at all as to the real cause of dysmenorrhœa. We know that in many instances it is associated with certain pathological conditions, but how these actually cause the pain is as yet disputed.

Some facts as to menstruation help us in understanding dysmenorrhœa. The uterus is an erectile organ (p. 65), and as the decidua menstrualis is five or six times thicker than the uterine mucous membrane, it is evident that metritis or pathological anteflexion when present will hinder the erection and expansion of the uterus, and cause intense pain analogous to the chordee of the penis in gonorrhœa.

In normal menstruation, a fluid made up of blood and epithelial debris escapes from the uterus. Probably, it does not drain away by mere capillary action, but is expelled by uterine contractions. There is no absolute proof of this, but it is a fair deduction from anatomical facts. If a patient be examined while menstruating, we may feel an arching or slight tension of the fornices indicative probably of uterine action.

Dysmenorrhœa is usually divided into certain forms. It is to be regretted that this has been done, because there have not been collected pathological facts sufficient to warrant a classification. The forms usually given are the following:—

Forms usually given.

1. Dysmenorrhœa associated with certain diatheses, such as the gouty and rheumatic;
2. Spasmodic dysmenorrhœa;
3. Membranous dysmenorrhœa;
4. Dysmenorrhœa associated with inflammatory conditions of the uterus, ovary, peritoneum or cellular tissue;
5. Ovarian Dysmenorrhœa.

The last term is applied to certain cases which were supposed to be specially connected with the ovaries, and which could not be classified under the preceding heads. The term is a most unfortunate one. It assumes a cause for dysmenorrhœa which is not, as yet, demonstrated; and, instead of pathological facts or a confession of our ignorance of them, gives us what we have too much of already—erroneous terminology.

Practical Varieties.

So far as our present knowledge goes we can speak of four varieties:—

1. Spasmodic dysmenorrhœa;
2. Congestive dysmenorrhœa;
3. Membranous dysmenorrhœa;
4. Dysmenorrhœa associated with mal-development of the sexual organs, pyosalpinx, fibromyoma uteri, rheumatic diathesis, and some other unknown causes.

The Erection and Expansion of the Uterus hindered.

1. and 2. *Spasmodic and Congestive dysmenorrhœa.* Of these the most frequent cause is pathological anteflexion, *i.e.*, anteflexion of the uterus produced by inflammation in the utero-sacral ligaments with cicatrisation. The pathology, diagnosis and treatment of this affection is given at pp. 360-366. We only remark here that it is a very serious lesion

owing to its inflammatory etiology. From the flexion produced, we get spasmodic uterine contraction accompanied with very great pain and expulsion of clots. Two theories of dysmenorrhœa have been already explained (p. 363). Those who hold the purely mechanical theory seem to forget that fluid blood passes easily through a capillary. Does any one believe that the lumen at the flexion is less than that of a capillary?

Spasmodic contraction of the os internum and constriction of the cervical canal are also advanced as causes.

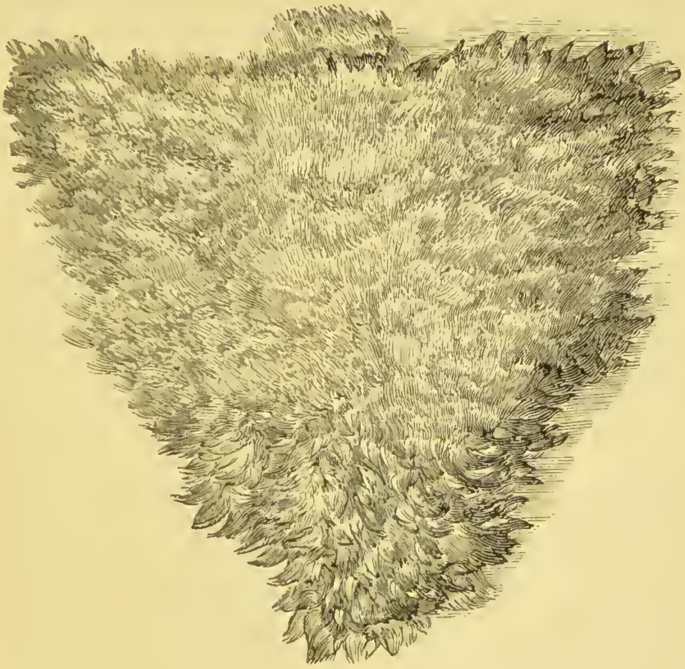

Fig. 312.

Sketch of a Dysmenorrhœal Membrane as seen under Water (*Sir J. Y. Simpson*).

Membranous Dysmenorrhœa.

3. *Membranous dysmenorrhœa.* In this condition, the superficial layer of the mucous membrane is cast off as a triangular sac or in shreds of a more or less firm consistence (figs. 312, 313). This may result from the occurrence of hæmorrhage in the deeper layers of the mucous membrane; and then we can understand that, according to the depth, we have present no part of the glands or only their cæcal extremities (*Solowieff and Gusserow*). Microscopically, there is excess of round cells and fibrillated tissue in the membrane.

Sir J. Williams, who has written ably on this subject, believes that, owing to an excess of fibrous tissue in the walls of the uterus, the mucous membrane is expelled in coherent shreds. This excess of fibrous tissue is due to defective evolution, sub-involution, or metritis. The membrane is, further, never a plastic exudation. *It is of the greatest importance to remember that it is not a product of conception, and should not be mistaken for an early abortion.*

4 *Dysmenorrhœa from other causes, as defective development of uterus, pyosalpinx*, etc. Many of these conditions are now being elucidated and cured by abdominal section.

TREATMENT.

Cautions as to Treatment.

At the outset we are met with a difficulty. As we are usually consulted for Dysmenorrhœa in unmarried women, the question of the propriety of a pelvic examination comes up. As Duncan has said—"No rules that I can give you will make up for want of good sense and good feeling on your own part, but I shall give you some hints. The first is that you should, as a rule, not resort to this treatment (by bougies) in an unmarried young woman without the concurrence of three parties—firstly, your own approval; secondly, that of the mother or guardian of the patient; and, thirdly, that of the patient herself. All of these should be quite aware of the circumstances, and of what it is proposed to do."

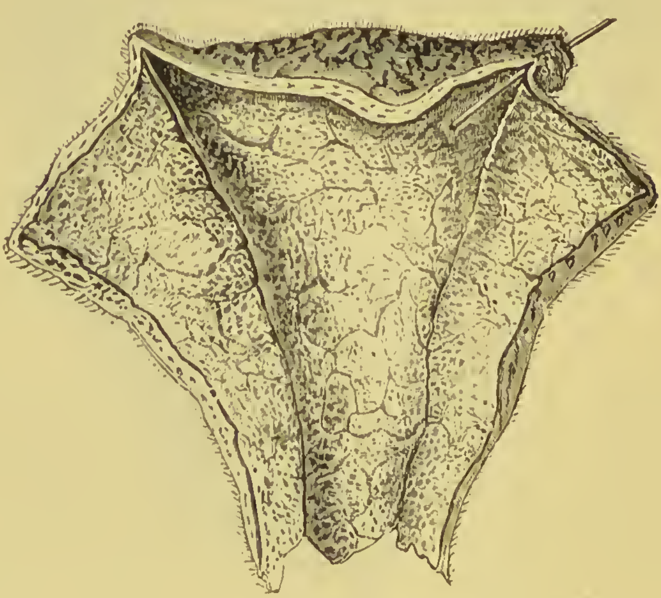

FIG. 313.

A DYSMENORRHŒAL MEMBRANE LAID OPEN (*Coste*).

Nothing can be more reprehensible than the vaginal examination of unmarried women for trifling ailments. When the Dysmenorrhœa is slight, make no examination but order some such mixture as the following.

℞ Spiritus chloroformi,
Spiritus ammoniæ aromatici, āā ℥ss.
Liquoris ammoniæ acetatis ℥i
Sig. Teaspoonful in a wine-glassful of hot water occasionally.

Viburnum prunifolium in capsules containing thirty drops can also be given (thrice daily). Liquor Caulophylli et Pulsatillæ Co. in drachm doses three times daily is excellent too.

Order a hot hip bath, or the feet to be put in mustard and water. On no account whatsoever allow alcohol in any form to be given. If the mother has been giving whisky and water or gin and water, at once point out the risk the patient is running. Do not give morphia, or other opiate unless driven to it; always give it yourself and hypodermically, never by the mouth or rectum, and give no prescription for it. Bromide of sodium may be given in ten grain doses three to four times daily.

When the Dysmenorrhœa is urgent, then a pelvic examination should be advised; the index finger well oiled can usually pass the vaginal entrance without injury to the hymen.

If pathological anteflexion is found, note the amount of inflammatory disturbance, the degree of flexion, and the implication or non-implication of the tubes and ovaries. Begin by ordering blisters to the iliac regions, bromide of potassium, the glycerine plug, and the hot vaginal douche. See that the bowels are regulated, and soft motions secured by the use of liquorice powder (Pulv. glycyrrhizæ co.) and occasional enemata, and that no tight lacing is allowed. Chlorotic patients should be put on Blaud's pills; and change of air, when requisite, ordered. Note the effect of this for some periods; and then if unrelieved, pass the sound or graduated bougies or use expanding dilators. This course benefits the Dysmenorrhœa, and it is safer than the use of stem pessaries; the dilatation by bougies seems to act like the stretching of the sphincter ani in fissure of the anus and often gives brilliant results. It is advisable to curette at the same time, and to pack the uterus with a strip of iodoform gauze. Some advise dilatation, curetting, and Dudley's operation on the cervix. The use of stem pessaries is now abandoned.

Patients with neurasthenia often suffer severly at the menstrual periods. Local treatment is contra-indicated, as the dysmenorrhœa often passes off while the general condition is improving.

If the Dysmenorrhœa is membranous, treatment is of little service, but dilatation, and curetting should be done. The following prescriptions may be tried.

℞	Liquoris arsenicalis	℥ij.
	Sig. Three drops in water thrice daily after food.	
℞	Liquoris arsenii et hydrargyri iodidi (Donovan's solution)	℥ij.
	Sig. Five drops in water thrice daily after food.	

The action may be analogous to that of arsenic in psoriasis.

Treat any endocervicitis or stenosis of cervix present. The prognosis is unfavourable as to cure. The patients are not necessarily sterile.

In the fourth group of cases, Salpingo-oophorectomy has not given the results anticipated. We have not, as yet, however, facts warranting any dogmatic utterance. Where the ovaries are developed but not the uterus, with serious menstrual molimina resulting in consequence, this operation is undoubtedly indicated. In cases of pyosalpinx, removal of tubes and ovaries gives good results.

Where any diathesis (rheumatic or gouty) is supposed to influence the Dysmenorrhœa, guaiac, colchicum and such specific drugs may be given.

CHAPTER LI.

STERILITY.

LITERATURE.

Ashby—Influence of Minor Forms of Ovarian and Tubal Disease in the Causation of Sterility: Am. Jour. Obst., 1894, Vol. xxx., p. 161. *Bumm*—Zur Behandlung der Sterilität bei der Frau: Centralb. f. Gyn., 1893, S. 981. *Duncan, J. Matthews*—Fecundity, Fertility, Sterility, and allied Topics: Edinburgh, A. & C. Black, 1866. On Sterility in Women: J. & A. Churchill, 1884. *v. Grünewaldt*—Ueber die Sterilität geschlechtskranker Frauen: Archiv f. Gyn., Bd. viii., S. 414. *Herman*—On the Relation between Backward Displacement of the Uterus and Sterility and Abortion: Lond. Obst. Trans., 1891, Vol. xxxiii., p. 499. *Kehrer*—Zur Sterilitätslehre: Beiträge zur klinischen und experimentellen Geburtskunde und Gynäkologie, Bd. ii., S. 76. *Müller*—Die Sterilität der Ehe: Billroth u. Luecke's Handbuch der Frauenkrankheiten: Stuttgart, 1885, S 297. *Palmer*—Sterility: Amer. Jour. Obst., 1894, i., p. 832. *Seeligmann*—Ueber Sterilitas Matrimonii: Berlin Klin. Woch., 1891, No. 41. *Sims, Marion*—Uterine Surgery: London, 1865. *Simpson, Sir J. Y.*—Obstetrics: Edin., A. & C. Black, 1871, p. 830. *Whitehead*—On the Causes and Treatment of Abortion and Sterility: London, 1847.

THE reproductive function is the most complex and subtle of all the functions of life. If we know little about the simpler function of menstruation so that there is room for great difference of opinion with regard to it, we know still less of the function of reproduction. Of its physiology, we know only that it requires the presence of ova and spermatozoa; of the constitutional influences affecting the vitality of these two and the conditions favourable for their conjugation, even of the place where this occurs, nothing is known. Nor have we yet data for studying the general laws of fertility for the human female. Much has been done by Darwin and others to elucidate these for plants; little is known of them for animals, and almost nothing for the human species.

Of the disturbances of the reproductive function, sterility belongs to Gynecology; abortion, retroflexion of the gravid uterus, and extra-uterine gestation belong more properly to Obstetrics.

Distinction between Absolute and Relative Sterility.

No simple and yet complete definition of sterility can be given. The word has quite a different meaning as we use it relatively or absolutely. As the opposite of fertility, it includes cases in which a child is not born till many years after marriage or the number of children is comparatively few; further, inasmuch as the reproductive function covers gestation as well as the birth of a viable child, sterility includes all cases of intra-uterine disease and death of the embryo or fœtus, resulting in abortion, premature labour, or the birth of a non-viable child. None of these cases are absolutely sterile, the sterility is *relative.* The term also necessarily covers all cases in which, under circumstances favourable to conception, this either has not occurred at all or the product has not gone the length of even an early abortion. Here the sterility is *absolute.* This raises the question as to when sterility is relative, and when absolute. What is the standard of fertility by which we decide that a woman is relatively sterile and measure the degree of that sterility? When can we say that a patient is absolutely sterile?

Relative Sterility.

Relative Sterility. At first sight, we should be inclined to regard the period of child-bearing as co-extensive with the period of menstruation. But it is not so. The period of fertility is not co-terminous with the period of menstrual activity: it begins later and ends earlier, its total duration being about fifteen years, during which time births take place about every eighteen or twenty months. Its commencement is determined by the year of marriage, in this country on an average the twenty-fifth year, the first child being born in most cases twenty months after marriage. It ceases usually about thirty-eight, some years before the menopause. Thus, as Whitehead puts it, there is a period of quiescence in the function of reproduction both at the commencement and at the termination of menstruation (*Matthews Duncan*).

Taking the foregoing considerations as giving us a standard of fertility, we learn that relative sterility may show itself in such various ways as these,—not having the first child within twenty months after marriage, having children at intervals of longer than twenty months, ceasing to have children within fifteen years after marriage. In applying these considerations to an individual case, however, we must of course take into account the age of the patient. There seems also to be great variation in the productive power of different individuals. One patient has many children without injury to health, while in another the birth of one child exhausts the reproductive function. Sir James Simpson found that among British peers unproductive marriages are relatively common (1 in 6, instead of 1 in 10). As the result of relative sterility we find that the number of children to a marriage in Britain is 5·2 or one-half of what it would be if all the conditions favourable to reproduction were fulfilled.

Absolute Sterility.

Absolute Sterility. The interval between marriage and the birth of the first child averages twenty months, and any protraction of this interval means a degree of sterility; but we cannot speak of absolute sterility until several years of married life have passed without even an abortion. Matthews Duncan found in his statistics of the births in Edinburgh and Glasgow for the year 1855, an average interval of seventeen months to the first child—two-thirds being born before the end of the second year, and only one-twenty-fourth after the fourth year. Hence, he concludes that there is no ground for the assumption of persistent sterility until the fourth year of married life has been entered upon.

Of the number of absolutely sterile marriages in Britain we have no data. The statistics of Sir J. Y. Simpson, based on the reports of the population of Grangemouth and Bathgate, which give the number of sterile marriages as 1 in 10, include abortions and all other cases in which a child would not be registered, so that they cannot be relied upon for data regarding absolute sterility. Seeligmann gives the proportion as 23 in 200, and would ascribe one-half of these to gonorrhœa in the male.

Etiology of Sterility.

The *Etiology* of sterility is too wide a subject to be exhaustively discussed here. We can only indicate what the causes are, and point out the necessity of taking a broad view of this question.

Amongst *general influences*, we note first of all the effect of *temperature* and *climate*, and of marriage between *near relatives*. Under *want of sexual agreement* have been placed many cases which have not been explained otherwise (such as the classical one of Napoleon and Josephine). *Age* has an undoubted influence; the period of nubility is from the age of twenty to twenty-five, and marriages before or after this period are less fertile. The influence of *disturbed nutrition* is seen in the association of sterility with obesity; it seems that the taking-on of fat is at the expense of the reproductive function, perhaps through interference with ovulation. *Chlorotic* patients are also sometimes sterile. The association of *Dysmenorrhœa* with sterility has been already referred to (pp. 289 and 364) and is a matter of everyday observation. Matthews Duncan found spasmodic dysmenorrhœa in 47·9 (159 out of 332) of his cases of sterility; while Marion Sims found it in 51·6 p. c. (129 out of 250) of his. Further, these conditions disappear together under treatment, and spasmodic dysmenorrhœa is a rare condition in fertile women.

As to *local causes*, we note that sterility is found associated with the following conditions already described: vaginismus, p. 555; hypertrophied cervix, p. 299; conical cervix with pin-hole os, p. 286; cervical catarrh, p. 323; anteflexion, p. 364; retroflexion (more rarely[1]), p. 374; endometritis, p. 338; ovaritis, p. 228; pelvic peritonitis, p. 172. The last three are probably the most important. Taking the function of reproduction instead of the various organs as the standpoint from which to regard sterility, we find that this function may be divided into three processes—insemination, impregnation of the ovum or conception, and gestation. A certain number of cases of sterility are due to defect in

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[1] Herman, *op. cit.*

insemination (*e.g.*, all cases of dyspareunia); but the most important group of cases coming under this head are those of absence or deficient vitality of the spermatozoa. As we are dealing here only with sterility in the female, this last cause of sterility is beyond our subject; but it is important to remember that Gross's investigations into male sterility show that it is probably the cause in every sixth case which comes before us. As to the relative importance of *conception* and *gestation*, the investigations of v. Grünewaldt show that interference with the latter is a much more important factor in sterility than is generally supposed. Investigating 500 cases of sterility from the standpoint of the influence that the condition of the uterine tissue has on gestation, he comes to the following conclusion: Conception forms only one link in the chain of processes involved in the fertility of marriage, and is of slight importance compared with the great number of vital processes implied in gestation; the point of greatest importance in the fertility of woman is her capability of carrying a fertilised ovum, which depends to a great extent on the integrity of the uterine tissue.

Kleinwächter[1] met with one-child sterility in 8·32 p. c. of his cases. The age at which the women married seemed to have nothing to do with it. He finds that the causes are the same as in the case of absolute sterility (apart from congenital malformations), viz.:—

Inflammation after puerperium	17·77 p. c.
,, not ,, ,,	12·22 ,,
Endometritis	17·77 ,,
Uterine displacements	12·22 ,,
,, neoplasms	8·88 ,,
Constitutional conditions	7·77 ,,
Male impotence	7·77 ,,
Uterine atrophy	5·55 ,,
Ovarian neoplasms	3·33 ,,
Unknown causes	6·66 ,,

Treatment. In the *treatment* of sterility, we must take a broad view of the etiology and not allow local conditions to influence us unduly. Attention to the general health, and patient waiting until at least three years of married life have passed is all that is required in the large proportion of cases. Entire cessation of intercourse for several months should be recommended, and can be secured by change of air to some watering-place at home or abroad, according to the patient's means. Where coitus is impossible or painful (as in cases of atresia and vaginismus) operative interference is called for immediately, and such cases offer the most satisfactory results in treatment (p. 556). In estimating the importance of operations on the cervix (p. 290), we must keep in view the rarity of this indication for treatment and the uncertainty that an operation by dilatation or division will be beneficial. Whether the sterility be due to the rigid condition of the cervix or the smallness of the os externum, such cases form only 4 p. c. (*Müller*) or 8 p. c. (*Kehrer*) of the total number of women who seek advice for sterility. In other words, taking Müller's statistics, the chances are 25 to 1 that the cause of sterility must be sought elsewhere than in the cervix.

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[1] Centralb. f. Gyn., xii., 287.

For cases of stenosis, of which sterility is the chief feature, Pozzi,[1] in addition to splitting the cervix, excises a prismatic piece of tissue from the raw surfaces on each lip, and stitches cervical mucous membrane to vaginal over each of the four surfaces. The cicatrisation which follows simple division (p. 291) is thus prevented. Massage and electricity (the negative pole being intra-uterine) have been advocated by Palmer, Bumm, and Seeligmann.

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[1] Nouvelle opération applicable à la sténose congénitale du col de l'utérus (Bull. et Mém. de la Soc. de Chir., 1893, t. xix., p. 93, et Ann. de Gyn., 1893, t. xli., p. 407).

SECTION X.

AFFECTIONS OF BLADDER AND RECTUM.

CHAPTER LII. The Bladder, Anatomy, Physiology, and Methods of Examination.
,, LIII. Affections of the Urethra and Bladder.
,, LIV. Vesico-Vaginal Fistula.
,, LV. The Rectum ; Coccygodynia.

APPENDIX.

Abdominal Section.
Anterior and Posterior Colpotomy.
Electricity in Gynecology.
Systematic Treatment of Nerve Prostration.
Hysteria.
Massage.
Case-Taking : Classification of Diseases of Women.
Sources of Gynecological Literature.

CHAPTER LII.

THE BLADDER: ANATOMY, PHYSIOLOGY AND METHODS OF EXAMINATION.

LITERATURE.

Barlow—Beiträge zur Aetiologie, Prophylaxe und Therapie der Cystitis: Arch. für Dermatologie und Syphilis, xxv., 1893. *Burckhardt*—Endoskopie und endoskopische Therapie: Tübingen, Laupp'schen Buchhandlung. *Chiene*—Bladder Drainage: Ed. Med. Jour., 1880. *Croom, J. H.*—On Retention of Urine in the Female: Ed. Med. Jour., April and May, 1878. *Fenwick, E. H.*—The Electric Illumination of the Bladder and Urethra: London, Churchill, 1888. *Foulis*—An Antiseptic Catheter for washing out the Bladder: Brit. Med. Jour., Jan. 30, 1886. *Fritsch*—Die Krankheiten der weiblichen Blase: Handbuch der Gynäk. bearbeitet von J. Veit., Bd. ii., Wiesbaden, Bergmann, 1897. *Gulland, G. L.*—On the Treatment of Bacteriuria by the internal Administration of Drugs: Edin. Hosp. Rep., Vol. iv., 1896, p. 294. *Hart*—Physics of Rectum and Bladder: Ed. Obst. Trans., 1882. *Kelly, H. A.*—The direct Examination of the Female Bladder with Elevated Pelvis, etc.: Amer. Jour. Obstet., Vol. xxix., p. 1. My work on the Disease of the Urinary Tract in Women: Amer. Jour. Obstet., 1896, Vol. xxxiii., p. 399. (This gives résumé of literature): Operative Gynecology, London, 1898, Vol. i. *Nitze*—Lehrbuch der Kystoskopie: Wiesbaden, 1889. *Noeggerath*—The Vesico-vaginal and Vesico-rectal Touch: Am. J. of Obstet., viii., 135. *Ogston*—Ed. Med. Jour., 1878. *Pawlik*—Ueber die Harnleitersondirung beim Weibe: Archiv f. klinische Chirurgie, Bd. xxxvi., Hft. 2. Pawlik *v.* Kelly: Amer. Jour. Obstet., 1896, Vol. xxxiv., p. 253. *Power*—Physiology of Micturition: The Practitioner, 1875. *Rubeska*—A Criticism on Professor Howard A. Kelly and his Discoveries in the Domain of Urinary Diseases: Amer. Jour. Obstet., 1896, Vol. xxxiii. *Sänger*—Ueber Tastung der Harnleiter beim Weibe: Archiv f. Gyn., Bd. xxviii., S. 54. *Skene*—Diseases of the Bladder and Urethra in Women: W. Wood & Co., New York, 1878. *Syme, James*—Observations in Clinical Surgery: Edin., Edmondston & Douglas, 1862. Second Edition. *Viertel*—Physikalische Untersuchungsmethoden der Blase: Veit's Handbuch, Bd. ii., Wiesbaben, Bergmann, 1897. *Wallace, D.*—The Electric Cystoscope: Edin. Med. Jour., 1890, pp. 712, 860. Also Cystoscopy, notes from an experience of upwards of Fifty Cases: *Ibid.*, 1891, p. 324. *Winckel*—Die Krankheiten der weiblichen Harnröhre und Blase: Billroth's Handbuch, Stuttgart, 1886.

Diseases of the bladder are of the greatest importance as they are not only very painful, but, for a reason to be given shortly, very intractable. In a Manual of the present scope, a full consideration of vesical disease is impossible; we therefore give a mere sketch, and refer the practitioner for details to Kelly's Operative Gynecology above all others.

ANATOMY AND PHYSIOLOGY.

Physiology of Urination.

For the anatomy, the student is referred to pp. 32 to 38. We should here point out that the female bladder, owing to its greater breadth transversely at the base (*v.* fig 326), is relatively more capacious than that of the male.

On looking into the bladder through the speculum the following landmarks and topographical areas are recognised—the internal urethral orifice, a point in the bladder opposite it, the ureteral orifices, trigone of the bladder, interureteric ligament, right and left halves of the distended bladder, which are again subdivided into upper and lower quadrants (*v.* fig. 316). Lesions can thus be located accurately.

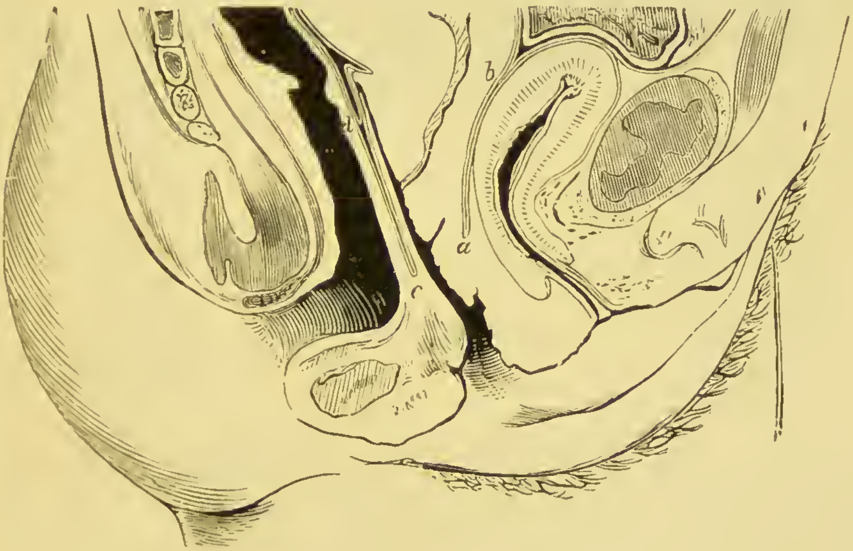

FIG. 314.

BLADDER IN SYSTOLE (*Braune*).

Urination.—The mechanism of the storage and expulsion of urine from the bladder is full of interest, both from a theoretical and a practical point of view. The urine trickles along the ureters, a result partly due to blood pressure and partly to the peristaltic action of the ureters themselves. It thus reaches the bladder, at this stage an empty flaccid sac with its upper half fitting into the lower calyx-like portion. Gradually the bladder distends, until at last the activity of the motor centre (whose constant action keeps the urethral muscles contracted) is reflexly inhibited, and the urine is expelled by the muscular contraction of the bladder and intra-abdominal pressure. The bladder is now contracted and, on section, has the shape seen at fig. 314—its shape in systole. The bladder then relaxes, *i e.*, becomes flaccid—its diastole, and once more the urine trickles into it (fig. 22).

The bladder therefore has, like the heart, its systole and diastole. A knowledge of this is important practically. It explains the intractability of inflammatory conditions of the bladder, since the bladder when inflamed does not get—what every inflamed organ requires—rest.

Composition of Urine.

The average amounts of the several urinary constituents passed in twenty-four hours, as given by Parkes, are the following :—

Water	1500·000 Grms.
Total solids	72·000
Urea	33·180
Uric acid	·555
Hippuric acid	·400
Kreatinin	·910
Pigment, etc.	10·000
Sulphuric acid	2·012
Phosphoric acid	3·164
Chlorine	7·000
Ammonia	·700
Potassium	2·500
Sodium	11·090
Calcium	·260
Magnesium	·207

Urine also contains various epithelial scales, a little mucus, nitrogen and carbonic-acid gases.

The reaction is acid, and the specific gravity is 1020.

METHODS OF EXPLORING THE URETHRA.

The urethra is explored by sound, finger, and speculum in the same way as the bladder. We need not therefore go into detail regarding these, but refer the student to methods of exploring the bladder.

Emmet's buttonhole operation is now little employed, but may be of use in some cases. It is performed as follows.

The patient is put in the lithotomy posture and a sound of calibre sufficient to stretch the urethra, passed. The object of the operation is to incise the urethra vertically and mesially but not to touch the meatus urinarius or neck of the bladder. The urethra is 1⅜ inches long, and therefore an incision of the vaginal tissues over the urethra ¾ of an inch in length will avoid the urethral orifice and neck of bladder. The vaginal tissue is caught up with a tenaculum and divided down to the canal. The scissors are now used to extend this up towards the neck of the bladder and down towards the urethral orifice. The incision in the vaginal mucous membrane should be one-third longer than that into the urethral canal, and the extra length should be at the bladder end.

No incontinence of urine is produced if the neck of the bladder be uninjured.

Through this incision polypi can be detected and removed, prolapse of the urethral mucous membrane can be excised, and medicaments applied.

Should the incision be made merely for temporary purposes it can be closed by silk-worm gut stitches including the mucous membrane of the urethra. When the operator wishes to make a urethro-vaginal fistula for purposes of treatment, he unites the edges of the mucous membrane of the vagina to the corresponding edge of the urethral mucous membrane by means of catgut or silk (Button-hole operation—fig. 315). This fistula can be closed when necessary in the ordinary way.

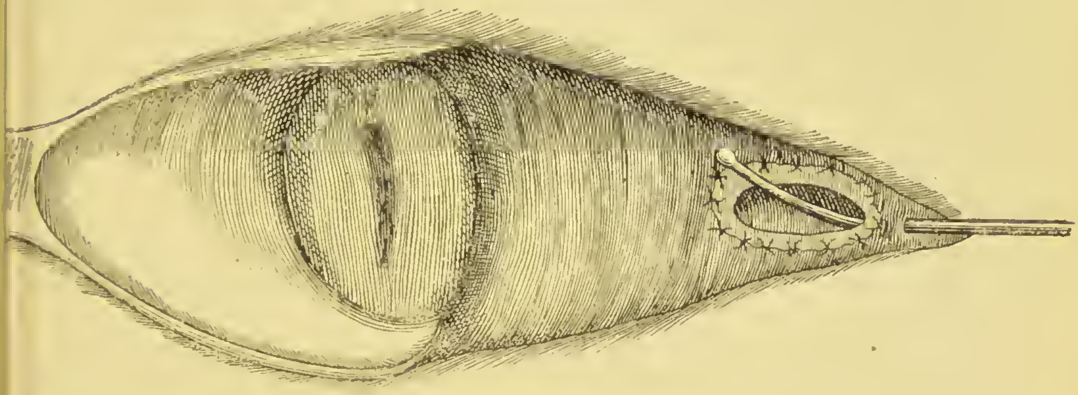

FIG. 315.

EMMET'S BUTTON-HOLE OPERATION ON THE URETHRA : the patient is supposed to be on her side and Sims' Speculum passed (*Emmet*).

METHODS OF EXPLORING THE BLADDER.

A. *By Catheter and Sound.*

Preliminaries. No instrumental investigation of the urethra and bladder is to be lightly undertaken. There is great risk that even with careful antiseptic precautions any instrument if used frequently may carry in pyogenic organisms from the urethra, and set up a cystitis which may ultimately pass to the pelvis of the kidney, or to the kidney itself and the connective tissue adjacent. In the urethra, organisms are said to be invariably present, "often pathogenic and especially pyogenic" (Gulland).

The catheter is passed for the purpose of drawing off the urine, while the sound is usually employed for diagnostic purposes—ascertaining the state of the mucous membrane, the presence of stone or other pathological conditions.

Method of passing the catheter. The instrument usually employed for this purpose is a male gum-elastic catheter, No. 8 or 10, but a glass instrument is better, the great advantage of glass being that it can be boiled prior to use. Battey recommended a long rubber catheter as a very useful instrument. The gum-elastic catheter must first be thoroughly washed with carbolic lotion (1–20), or corrosive sublimate (1–2000), and then its end dipped in glycerine and corrosive sublimate (1–2000). Cleanliness in using the catheter is of the very highest importance, as cystitis, renal disease, and even pyæmia may be caused in cases where the urine has been rendered putrid by the catheter. It is of great importance therefore for the nurse to cleanse the external parts carefully first, and to boil the catheter employed.

The catheter may be passed by "touch" alone without exposure of the patient, but this is not advisable as there is risk of contamination of the catheter and infection of the bladder. The patient lies on the left side square across the couch, with the hips at the edge and the knees drawn up. The pulp of the index finger of the left hand is passed over the base of the perineal body and onwards until it touches the vestibule. It should then be carried a little backwards until the meatus is felt at the base of the smooth vestibule and in the middle line. The catheter is passed with the right hand; the index of the left hand feels, through the anterior vaginal wall, that it passes into the urethra. After the last drop of urine has been expelled, the catheter is withdrawn and the finger held over its proximal end so as to retain the fluid remaining in the catheter until it can be poured into a receptacle.

The safest method is as follows. The patient lies on her back with the knees drawn up and separated. The hands are thoroughly cleansed, and then the labia separated so as to expose the urethral orifice. This is carefully cleansed with boracic lotion and the catheter passed by sight while the labia are held apart.

The indications for the catheter are the various causes of retention of urine (*v.* p. 643); at present we only remark that it should never be passed unless necessary, and that the greatest care should be taken not to introduce septic matter. Foulis recommended a special apparatus for washing out the bladder which may be used for drawing off the urine also.

B. *Digital Exploration of the Bladder.*

Owing to the large amount of muscular and elastic tissue in the urethra, it can be stretched to an extent that permits of digital examination of the urethral and vesical lining membrane. Recent methods of examination have however superseded this proceeding, and we only describe it as of historical interest.

It is not generally known that as early as 1861 Syme of Edinburgh wrote as follows, in regard to the removal of an encrusted hairpin from the female bladder,—"I dilated the urethra by introducing a series of bougies gradually increased in size until the point of my finger was admitted into the neck of the bladder, where, feeling the tense resisting fibres situated there, I made a very slight incision. . . . The finger then readily entered the bladder. . . . The patient suffered no inconvenience, and in the course of a few days, having completely regained the power of retention, was dismissed."

Dilatation of Urethra with Finger.

Method. With the patient lying in the lithotomy posture and under chloroform, the tip of the little finger is placed against the meatus and by a rotary motion passed through it in the direction of the urethral axis. The meatus is the most resistant portion of the urethra; therefore, to aid in its dilatation, some recommend to notch it with radiating nicks. This is unnecessary (*A. R. Simpson*). By steady pressure, the little finger is first pushed in and then the index one substituted. Graduated cervical dilators are of great use here also. For exploratory purposes this is sufficient; to complete the examination, however, the bimanual should be performed. This is aided by the middle finger in the vagina, and is therefore termed the vesico-vaginal bimanual. Instead of a general anæsthetic, cocaine may be injected locally.

The presence of stone or of tumours, the state of the mucous membrane of the bladder, the nature of obscure bodies in front of the uterus can all be thoroughly ascertained; vesico-vaginal fistulæ can be examined if the vagina has been obliterated; intestino-vesical fistulæ can be detected; calculi, impacted in the vesical portion of the ureters, can be removed; fissures of the neck of the bladder can be stretched; Winckel adds to these that we can open a hæmatometra through the bladder, when its evacuation between the bladder and rectum is impossible—a very rare indication. The Fallopian tubes can be felt with the finger in the bladder (*Noeggerath*); and, in one special instance, Croom proved by this method that the sound had perforated the walls of the thin superinvoluted uterus and had not passed along the Fallopian tube.

As already mentioned, however, this digital dilatation is at present practically not employed, but is superseded by specular and postural examination.

C. *Specular Examination aided by Posture: Ureteric Catheterisation.*

Attempts to examine the interior of the bladder by specula, without distension of the bladder, are not satisfactory. The catheterisation of the ureters after the finger had been passed through the urethra (fig. 316) proved difficult, but mainly by the work of Pawlik and Kelly intravesical examination has been rendered much easier, and an interesting and comparatively simple method evolved. We follow Kelly's method in our description.

The principle of Kelly's method is, that *if the hips be well elevated or the patient placed in the genupectoral posture, the urethra dilated and a speculum passed in, air will pass into the bladder and its walls will become separated and can be illuminated so that the vesical mucous membrane and especially the ureteric openings can be inspected.*

Method practised by Kelly. The patient is anæsthetised. The urethra may be dilated by graduated dilators up to a diameter of 12 mm, but it will be found sufficient to pass the special conical dilator used for calibrating the urethra, to the level of 7-9 or 10 mm. A speculum with an obturator is then introduced and the patient's hips raised by means of cushions 12-16 inches above the level of the table (fig. 317). If the patient is examined in the genupectoral posture, her position is similar to that for the examination of the rectum, shown in fig. 348.

The obturator is then withdrawn, air passes in, and by means of a small electric lamp and mirror (fig. 318), light is thrown into the interior of the bladder. Care must be taken not to hold the lamp too near the patient's skin lest it be burnt. Any urine in the bladder will require to be sucked out with tube and suction bulb.

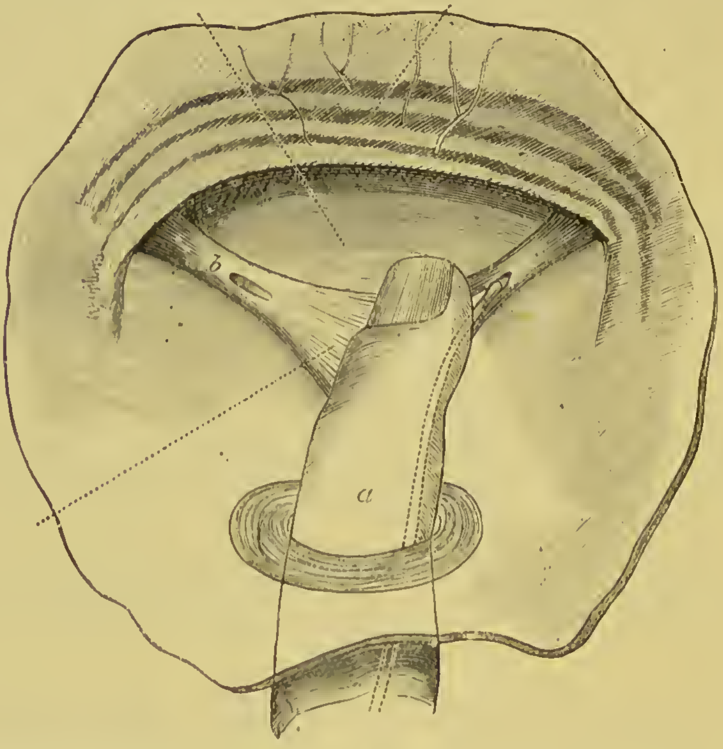

FIG. 316.

FINGER PASSED THROUGH URETHRA INTO BLADDER TO GUIDE CATHETER INTO LEFT URETER. *a* Internal Sphincter of Urethra, *b* Orifice of right Ureter, *c* Inter-ureteric Ligament (*Winckel*). Instead of using the finger, the catheter is now introduced by sight through the speculum.

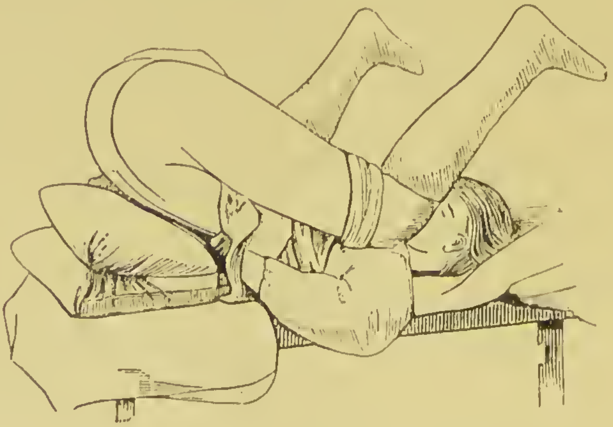

FIG. 317.

POSITION OF PATIENT FOR EXPLORATION OF BLADDER AND URETER (*after Kelly*).

The walls become separated by a distance varying between one and two inches. If the speculum (fig. 319) be sloped 30° to one or other side (as shown by the direction of the limbs of the V marked on its side) the ureteric orifices can be seen, and a catheter passed into them. Slender catheters and bougies can be passed up to the pelvis of the kidney, and the ureters thus defined prior to hysterectomy.

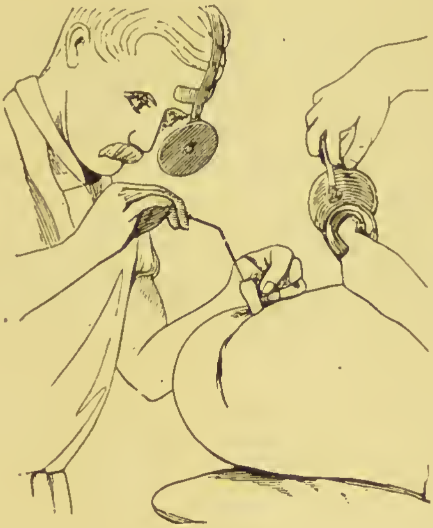

Fig. 318.

Left Ureteral Orifice exposed and Searcher engaged. Electric Lamp held by Assistant (*after Kelly*).

This method must be carried out with strict antisepsis, and only when necessary and other simpler means have failed.

The ureteric catheter can also be passed in the genupectoral posture and without any preliminary dilatation of the urethra. The interureteric ligament can be mapped out through the anterior vaginal wall, and thus affords a guide to the introduction of the catheter or bougie into the ureter.

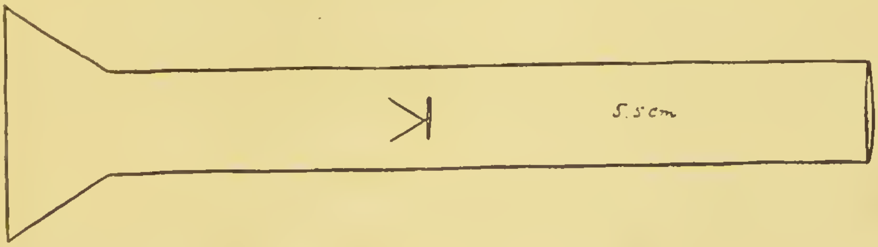

Fig. 319.

Speculum marked for finding Ureter (*Kelly*).

Electric Endoscope.

This handy and convenient instrument has now been used with great success in the diagnosis of vesical conditions. It would take up too much space to describe its construction and use fully; these can be found in the special works on this subject. We may, however, state that the instrument has been brought to its present value chiefly by the labours of Nitze and Leiter, and that the introduction of the small incandescent lamp as the illuminating agent has probably been the greatest improvement.

By its means we can ascertain the position of the ureter in operating on vesico-vaginal fistula and prior to excision of the cancerous uterus; and in proposed excision of a kidney we can ascertain the state of the other kidney by examination of the urine from it. For a full description see the papers by Fenwick and Wallace. Viertel's article in Veit's Handbuch der Gynäkologie, also gives a good account.

Pryor's cystoscope has a small electric lamp, and can be used with the bladder distended by air. In using it Pryor puts the patient in the lithotomy posture, and then elevates the table to the Trendelenburg position.

CHAPTER LIII.

AFFECTIONS OF THE URETHRA AND BLADDER.

For Literature *see* Chapter LII.

MALFORMATIONS OF THE URETHRA AND BLADDER.

These comparatively rare malformations are easily understood on consideration of the devolopment of the organ.

The bladder and upper portion of the urethra are derived from the anterior division of the primitive gut (entodermal cloaca), the very top of the bladder only being allantoic. The lower portion of the urethra may be urinogenital sinus, or may be formed by fresh invagination of the urinogenital sinus after the latter has been blocked by the Wolffian bulbs (*v.* p. 74). The developmental defects are therefore the following:—

(1) Total absense of urethra;
(2) Defect of external portion of urethra—hypospadias;
(3) Defect of internal portion of urethra;
(4) Atresia of the urethra (in malformed fœtuses);
(5) Extroversion of the bladder.

We would here only note the rarity of these conditions, and refer the practitioner to Kelly and Winckel for details.

DISEASES OF THE URETHRA.

Of these the most important are Displacements, Neoplasms, Urethritis, Dilatation, and Stricture.

DISPLACEMENTS.

These will be easily understood by reference to those of the bladder. *Urethrocele* is a pouching of the urethra and vaginal wall allowing the lodgment of stale urine. Its first stage is probably a local abscess. It is treated by excising a portion of the urethral wall and uniting the edges by stitches.

Prolapse of the mucous membrane of the urethra through the urethral orifice may be remedied by the button-hole operation. The incision is made down to the submucous tissue, and the mucous membrane pulled through this until the excess at the urethral orifice disappears. The excess at the button-hole is then cut off and the wound stitched. A simpler method is to cut off the excess at the urethral orifice, catching the edges as they are cut and uniting with fine catgut.

NEOPLASMS OF THE URETHRA; URETHRAL CARUNCLE.

Urethral Caruncle.

The urethra is liable to be invaded by papillomata, polypi, sarcomata, cysts, carcinomata, and vascular growths (angiomata).

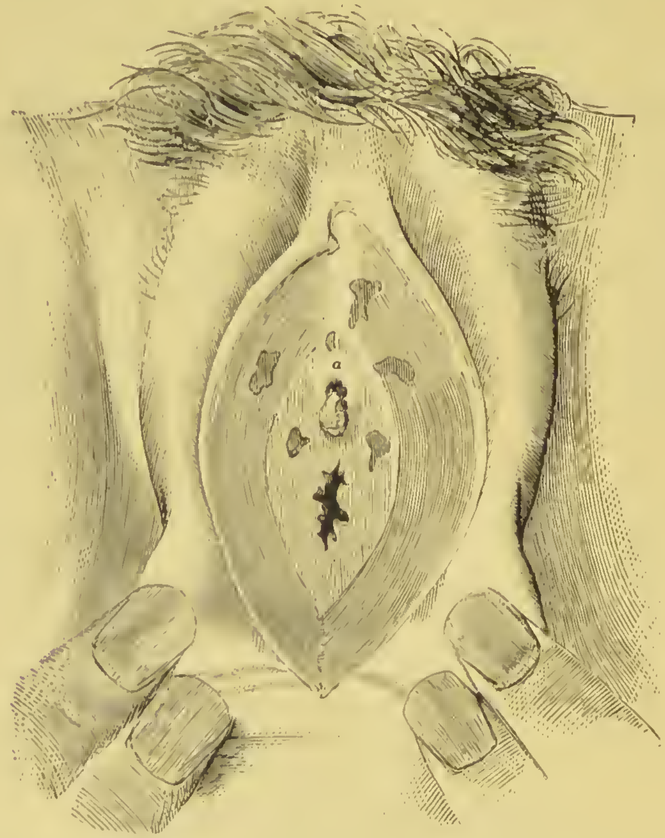

FIG. 320.

CARUNCLE AT URETHRAL ORIFICE (*a*) AND, IN ADDITION, NEUROMATA IN SURROUNDING MUCOUS MEMBRANE—*see* page 576 (*Sir J. Y. Simpson*).

Of these last, the most common is the well-known Urethral Caruncle.

Pathology. This is a vascular excrescense varying in size from a pin head to a strawberry; it consists of dilated capillaries in connective tissue, the whole being covered with squamous epithelium. *Physical Signs.* A cherry-red tumour, exquisitely tender and vascular, is seen at the urethral orifice (fig. 320). *Symptoms.* These are pain on micturition or even retention of urine, and pain on coitus. *Treatment.* Place the patient under chloroform in the lithotomy posture, and destroy the growth by Paquelin's cautery at a dull heat. If bleeding occurs do not treat it lightly; plug the vagina, bringing the last strips of gauze over the urethral orifice and fixing with a perineal band.

As regards the other neoplasms, papillomata are painless, sarcomata very rare, their nature being determined microscopically; while carcinomata appear as hard peri-urethral tubercles which break down (*Skene*). In regard to treatment polypi may be removed by the curette, or by small loop-snares when high up. An incision into the urethra may sometimes be necessary for the removal of tumours. Polypi in the urethra may cause great difficulty in micturition and should be suspected in intractable cases, and examination made by speculum or incision of urethra. We may also have specific inflammatory changes in Skene's "tubules" (*v.* p. 33) simulating urethral caruncle. These may be gonorrhœal, simple catarrhal, or tuberculous. The last is usually found with tuberculous disease elsewhere.

The tubules may require to be split up and cauterised.

URETHRITIS.

Acute urethritis is usually part of a gonorrhœa. When pus is secreted, the urethra can be felt swollen and tender; the pus can be squeezed out of the urethral orifice by pressure from above downwards; on passage of the sound, pain is felt in the urethra although no cystitis be found.

Treatment. Give diluent drinks so as to increase the flow of urine. Copaiba may be given in the form of the well-known Nesbitt's specific:—

℞ Liquoris Copaibæ Co. (Nesbitt) ℥ij.
Sig. Teaspoonful thrice daily.

Iodoform bougies may be passed in, and counter irritation applied in the shape of the tincture of iodine over the anterior vaginal wall.

Urethritis is very intractable. Emmet advised his button-hole operation to relieve tension and allow of accurate application of local remedies, but the bladder speculum is now used for the same topical applications.

DILATATION, AND STRICTURE OF THE URETHRA.

The urethra may be unusually *dilated*, a condition rarely met with; in some cases the dilatation has been caused by coitus, as in malformations of the vagina (*v.* p. 281). The dilatation may be local or general. When it is general, the cautery may be used to burn a vertical furrow, the rest of the urethra being guarded by a speculum. For other operations *see* Kelly's Operative Gynecology.

Stricture of the urethra is a rare condition and readily yields to dilatation by bougies or to incision.

DISEASES OF THE BLADDER.

Of the diseases of the bladder we shall here consider Displacements, Neoplasms, Cystitis, and Stone in the Bladder. Vesico-vaginal fistula will be considered in a separate chapter (Chap. LIV.).

DISPLACEMENTS OF THE BLADDER; CYSTOCELE.

The female bladder when empty lies behind the pubes and usually to one or other side. It is never exactly central.

The mobility of the Bladder.

From its loose attachment to the pubes, it is pre-eminently displaceable. (1) It is drawn up during labour; and (2) is displaced upwards by retroversion of the gravid uterus, pelvic ovarian or fibroid tumours, and pelvic hæmatocele. (3) It may be adherent to the anterior surface of an abdominal ovarian or fibroid tumour, and may thus be cut into on abdominal section unless care is taken. (4) It is displaced downwards in prolapsus uteri and in cystocele. (5) In utero-sacral cellulitis, the bladder is drawn back and fixed; its systole is thus interfered with, which explains some cases of so-called hysterical retention of urine. From this mobility it follows that the height of its fundus above the symphysis gives no indication of the amount of urine in the bladder.

By *cystocele* we understand a pouching of the posterior wall of the bladder downwards and backwards; the uterus and summit of the bladder are in normal position.

Senile form of Prolapsus.

Many a case, regarded as cystocele, is really part of a prolapsus uteri; on the other hand, the so-called "senile prolapsus uteri" is really a cystocele; at the menopause the cicatrisation of the vaginal walls chiefly affects the posterior one, and thus the bladder tends to bulge outwards at the vaginal orifice.

The diagnosis is easily made by the bimanual and use of the sound. The treatment consists in the use of a ring pessary with diaphragm (fig. 304). Should this fail, the vagina should be packed with oakum; or a raw surface (as shown at fig. 308) may be made and stitches applied.

NEOPLASMS OF THE BLADDER.

Pathological anatomy. We may have mucous, fibroid or fibro-myomatous polypi. There may also be sarcomatous or carcinomatous disease of the bladder wall, as well as tubercle. In tuberculous disease the ulcerated surface has been removed by Schatz in a supra-pubic operation. The carcinomatous condition is not infrequent, and is termed by some "villous cancer." It is most common at the trigone, and is held by some authorities not to be malignant. The bladder may be secondarily affected in carcinoma uteri (*v.* p. 479).

Symptoms. These are disturbances of micturition, with bloody and phosphatic urine.

Physical Signs. The passage of the finger into the bladder or specular examination will show the position, shape, and characters of the growth.

Treatment. This will vary according to the position, nature, and pedunculation or non-pedunculation of the growth. Thus it may be twisted off by narrow polypus forceps, snared by a loop of fine catgut, or removed by incision into the posterior wall of the bladder and use of the galvano-cautery or curette.

In malignant disease of the bladder excision has been practised by Pawlik, M. D. Mann and others (*v.* Mann's paper, Am. Gyn. Trans., 1901, p. 183). In both his cases there was early recurrence.

CYSTITIS.

Nature. An acute or chronic inflammatory affection of the mucous membrane of the bladder.

Pathological anatomy. In the acute catarrhal form, we have congestion of the vessels and loss of epithelium; in the chronic catarrhal form, the congestion is duller and there is marked rugosity of the lining of the bladder. The submucous and even the muscular tissues also become affected. The mucous membrane may be ulcerated and the muscular tissue exposed.

Various micro-organisms may be found, usually the tubercle bacillus, bacillus coli communis, pyogenic organisms; details as to these and the methods of investigation to be employed will be found in Gulland's or in Barlow's paper. In order to demonstrate the micro-organisms, the urine is drawn with all aseptic precautions, centrifuged, and a culture made from the sediment.

The inflammatory process may extend deeper, to the muscular tissue (interstitial cystitis), to the peritoneum (pericystitis), or to the connective tissue near (paracystitis). Occasionally, though rarely, we may have diphtheritic inflammation.

Results of Cystitis.

In advanced cases, the patient may be septicæmic, and there is often hydro-nephrosis. In some cases of prolonged retention the mucous membrane may slough off and be passed per urethram, but is usually regenerated.

Etiology. The causes are as follows Gonorrhœa; latent gonorrhœa; exposure to cold; injury from coitus; prolonged parturition; introduction of septic matter by catheter or bougie; prolonged retention of urine; stone.

Symptoms. In *acute cystitis* the patient has very frequent and painful micturition. In *chronic cystitis* also there is frequent micturition, but accompanied by less intense pain; there are, further, shooting pains with secondary phenomena—septic, vascular, and nervous.

Physical signs. (*a*) *Acute cystitis.* The urine has a lowered specific gravity and acid reaction; the colour is little altered, and mucus is present in excess. On vaginal examination, pain is not felt when pressure is made on the posterior vaginal wall, but is felt severely *when the anterior wall is touched.*

Characters of Urine in Cystitis.

(*b*) *Chronic cystitis.* The urine has a low specific gravity, is usually alkaline, and is often offensive; it contains pus, epithelium, phosphates, and bacteria; albumen, derived from the pus, is present. The vaginal examination gives the same results as in acute cystitis. If the finger be passed through the urethra (*v.* p. 628), the roughened condition of the lining membrane is felt; crystals of phosphate and marked rugosities can also be detected.

Genito-urinary phthisis is often diagnosed as chronic cystitis. In the former condition we get at first the symptoms of chronic cystitis—viz., purulent urine, pain, and intractability to treatment. Local examination of the bladder may give no definite result, and if the kidney is not palpated its enlargement and purulent condition may not be noticed until the disease is far advanced.

Prognosis. In both acute and chronic cystitis the prognosis is not good; the treatment is difficult; in bad chronic cases the patient's strength sometimes becomes exhausted, and septicæmia may cause death.

Treatment of Acute Cystitis.

Treatment. (*a*) *Acute cystitis.* Put patient on milk diet, and give Friedrichshall or Carlsbad water freely. Diluent drinks may be taken *ad libitum.*

The following prescription is useful:—

℞	Potassii Bicarbonatis	ʒ iss.
	Tincturæ Hyoscyami	℥ i.
	Infusum Buchu vel Pareiræ vel Uvæ Ursi ad	℥ vj.
	Sig. Tablespoonful thrice daily.	

Urotropin may be used in 10 grain doses three times a day. It is a very efficient bladder antiseptic.

In gonorrhœal cystitis the following may be substituted:—

℞	Liquoris Copaibæ Co. (Nesbitt)	℥ ij.
	Sig. Teaspoonful thrice daily.	

If the pain is very acute give morphia suppositories ($\frac{1}{4}$ grain) at night, omitting the mixture with the hyoscyamus if necessary.

For (*b*) *Chronic cystitis* we recommend the following treatment *seriatim.*

Treatment of Chronic Cystitis.

1. Put on milk diet with abundant fluids, and purge freely. Give—

℞	Acidi Nitrici diluti	ʒ iij.
	Tincturæ Hyoscyami	℥ i.
	Infusum Buchu ad	℥ vj.
	Sig. Tablespoonful thrice daily.	

The hyoscyamus eases the pain; and the nitric acid corrects the alkaline phosphatic urine, for which also benzoate of ammonia is admirable.

℞	Ammonii Benzoatis	ʒ iii.
	Aquæ	℥ vj.
	Sig. Tablespoonful thrice daily.	

The benzoate of ammonia is converted into hippuric acid, and corrects alkalinity. Lithia water, tincture of belladonna, and Nesbitt's specific are also useful.

Salol in 5 to 10 gr. doses thrice daily is also excellent. Boracic acid in 5 to 10 gr. doses needs caution in its use owing to its tendency to set up gastric catarrh. Urotropin is often useful.

Iodoform emulsion (5–10 p. c. with gum acacia, glycerine and water) may be injected into the bladder.

2. If these fail, then wash out bladder as often as possible by means of double catheter, such as Skene's, using corrosive sublimate (1-5000 or 8000), weak boracic lotion, or carbolic lotion. Instead of a double catheter a bladder douche may be used. This consists of a small douche-can with rubber tube attached. To the end of the latter the vertical limb of a glass Y-shaped tube is fitted, while to the others are attached pieces of tubing, one of which dips into a pail at the bedside, while the other is firmly secured to a glass catheter which has been sterilised. These two tubes are each provided with a clip. The method of using is as follows. The lotion is allowed to run from the douche-can so as to displace all air from the tubes. The clips are then applied. The catheter is passed, the clip removed from its tube, and the fluid allowed to run in till the patient feels the bladder distended. This tube is then clipped and the one leading to the pail opened, the result being that the fluid flows out from the bladder into the pail. This is repeated several times until all the fluid in the douche has been used.

A simple bladder douche can be made with a glass funnel and india-rubber tubing. By raising it and lowering it, fluid can be made to pass in and out. A very good method is to inject with a Higginson syringe, using a narrow conical noozle which fills up the urethral orifice. The bladder can thus be distended, the fluid acting more actively, and the retentive power of the bladder can be thus increased. We strongly recommend weak corrosive sublimate as a bladder douche. Paint anterior-vaginal wall with tincture of iodine if necessary.

3. A long (winged) india-rubber catheter may be kept in the bladder so as to drain off the urine constantly and give the bladder rest. The patient need not remain in bed if the Skene-Goodman catheter (fig. 321) is used.

4. In obstinate cases, the formation of an artificial vesico-vaginal fistula gives excellent results. To do this, chloroform the patient; place her in the lithotomy posture and apply Sims' speculum. Open into the bladder through the anterior vaginal wall, in the middle line with the scissors, as follows: pass a sound into the bladder, project the point into the vagina, and then by means of a pair of straight scissors open the bladder in the middle line. The mucous membrane of the bladder is then stitched to the adjacent vaginal mucous membrane by means of chromic catgut.

The urine trickles through the artificial fistula; in this way the bladder gets complete rest, and can be thoroughly washed out.

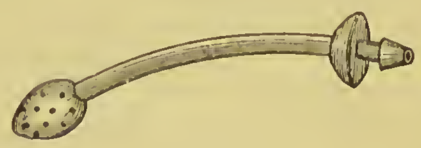

FIG. 321.

THE SKENE-GOODMAN SELF-RETAINING CATHETER; AN INDIA-RUBBER BAG CAN BE WORN WITH IT (*Skene*).

After some months the fistula is easily closed, as in the operation for vesico-vaginal fistula. Severe cases of cystitis will tax, more than any other disease, the practitioner's patience and knowledge. It is well to keep in mind the reason of this intractability—viz., the inability of the bladder to remain at rest, and the micro-organismal origin of most cases.

As can be seen from what has gone before, the principles of treatment are the following: (1) to correct abnormalities in the urine; (2) to allay the irritability of the bladder; (3) to lessen the congestion of the bladder by purgatives and counter-irritants, and to render the urine bland and lessen the work of the kidneys by milk diet; (4) to allay the irritable condition of the bladder and counteract putrefaction or gonorrhœal inflammation by injection; (5) to give it complete rest by a permanent catheter, or, in extreme cases, by an artificial fistula.

CALCULI AND OTHER FOREIGN BODIES IN THE BLADDER.

The female bladder is liable to receive foreign bodies from three sources.

A. Calculi from the kidneys—uric acid, oxalates, phosphates, or cystine.

B. Substances from neighbouring organs—pus from pelvic abscess, concretions from the intestines, bones from an extra-uterine fœtation, pessaries from the vagina, echinococci, and other parasites such as those associated with chyluria.

C. Foreign bodies introduced wilfully into the bladder by patients of depraved habits; these may form nuclei for stones (fig. 322).

Of these, *calculi* are the most important. Stone is less common in the female than in the male, as small calculi can pass along the dilatable female urethra; occasionally, therefore, the gynecologist has to remove from the urethra small stones impacted there—usually at the meatus urinarius. The introduction of foreign bodies, which act as nuclei, is more common in the female.

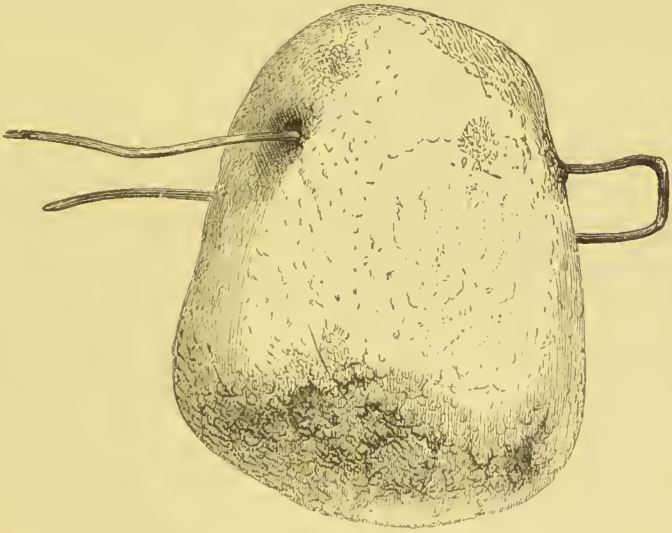

FIG. 322.

LARGE STONE WHICH FORMED ROUND A HAIR-PIN AS NUCLEUS, EXTRACTED BY VAGINAL LITHOTOMY (*Angus Macdonald*).

Symptoms. These are severe pain in micturition, especially at the close; alterations in character of urine; blood in urine.

Diagnosis of Calculi.

Physical Signs. The stone, when at all large, can be easily detected bimanually; when any doubt exists, the use of the sound or the passage of the finger into the bladder renders the diagnosis easy.

Treatment. Measure the stone: if small and soft, crush and wash out; if very large or hard or if it have a nucleus, extract by vaginal incision. This incision may be stitched up after the operation, or kept open when the bladder has been much irritated; it can afterwards be stitched as in vesico-vaginal fistula. Supra-pubic lithotomy is sometimes required. This is done in the Trendelenburg posture by means of a curved, transverse incision close above the pubes. The operator thus enters the prevesical tissue and bladder, and does not open the peritoneum. The stone is then extracted, and the wound closed or left open and drained with iodoform gauze (Pryor).

Other foreign bodies can be grasped by polypus forceps or manipulated out, if small or slender. When large, they may be extracted as in the case of large stones.

FUNCTIONAL DISEASES OF BLADDER.

Functional Affections of the Bladder.

By these we understand derangements of the bladder in regard to urination. Either these are due to causes as yet unascertained, or the same derangement (*e.g.*, retention) is associated with many lesions.

The chief functional diseases are—

Irritability,
Incontinence,
Retention.

In regard to all of them, we may remark that in no case should the diagnosis of a functional disease of the bladder be made until the practitioner is satisfied that there is no organic lesion.

Irritability. In this, frequent micturition associated with a disagreeable feeling is present. It may be due to excessive acidity of the urine, but is often a nervous affection. When it is due to excessive acidity give lithia, or potash, or Vichy water.

℞ Lithii Carbonatis gr. v.
Fiat pulv. mitte tales vj.
Sig. One thrice daily.

Incontinence, or inability to retain urine long enough, is most common in little girls; occasionally we meet with it in adults, as the result of prolonged labour, as a permanent condition from infancy, or in cases of oxaluria.

In the incontinence of girls, note whether there be any irritability of the genitals (vulvitis) or ascarides. Goltz found that, where section of the spine in the dog above the lumbar enlargement had produced retention of urine, he could make it urinate by sponging the anus with cold water; a reflex impulse passed from the rectum, lessening the activity of the inhibitory centre and allowing bladder contraction. In a child, ascarides in the rectum will act in the same way when it is asleep.

Treatment. Treat the irritating cause—as vulvitis or ascarides. If no irritating cause be detected, then give belladonna.

℞ Tincturæ Belladonnæ ʒij.
Sig. Three drops thrice daily.

In strumous cases, give syrup of the iodide of iron or cod liver oil.

℞ Syrupi Ferri Iodidi ℥ij.
Sig. Thirty drops thrice daily.

The Faradic current is also indicated in some cases.

Retention of Urine. Palpation shows a fluctuating mesial tumour rising into the abdomen; the position of the fundus of the bladder gives no indication of the amount of urine, as it may be tilted up by retroversion of the gravid uterus. Remember that a bladder may be distended so as to be as large as a six or eight months' pregnancy, and that constant dribbling-away of the urine may be a symptom of retention. Examine the pelvis for an organic lesion.

Retention may be due to one of three great classes of causes —

Hysterical,
Reflex,
Mechanical.

1. *Hysterical.* By this we mean that from perversity or a prurient desire to have the catheter passed, a patient feigns inability to pass urine.

The treatment is to give a hot hip bath followed by a cold one; if the catheter is needed, get it passed by a nurse of unsympathetic tendencies.

2. *Reflex* causes are the following:—

(1) Gonorrhœa;
(2) Urethritis;
(3) Irritable caruncle;
(4) Carcinoma, urethral and vaginal;
(5) Perineal and especially vestibular tears after labour, tears of cervix;
(6) Ligature of internal piles.

The treatment is hot appliances (1), (2), (3), and (5), and (6); and the catheter in (4). Remove the source of irritation when possible.

3. *Mechanical.* These are pressure of fibroids, retroversion of the gravid uterus; ovarian or parovarian tumours (pelvic and retro-uterine).

Where the tumour is impacted in the pelvis, a silver male (No. 10) catheter will pass best. The urethra is compressed, the bladder bulging over the symphysis; accordingly, a rigid instrument whose handle can be carried to the perineum is good

Final Cautions as to Bladder Cases. 1. Remember that pus in the urine does not necessarily mean that the *bladder* is affected. Keep in mind the possibility of disease in the ureter, in the pelvis of the kidney, and in the kidney itself. Do not forget the possibility of pus forming in the neighbourhood of the kidney and opening into the urinary tract. In a bladder case, always palpate and percuss the abdomen.

2. Make out as much as possible by examination of the urine, by bimanual examination of the bladder, and by the use of the sterilised sound before proceeding to more active methods.

3. Dilatation of the urethra and other instrumental means are excellent but require caution, as they often set up fresh irritation.

4. In cystitis, give drug treatment, and treatment by milk diet a thorough and careful trial.

5. In all operative treatment, take the most strenuous precautions as to antisepsis and asepsis.

6. In intractable cystitis, the formation of an artificial fistula is a form of treatment more controllable in its ultimate results than extreme urethral dilatation.

CHAPTER LIV.

VESICO-VAGINAL FISTULA.

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PATHOLOGICAL ANATOMY AND VARIETIES.

The septum between the urinary and genital tracts may be broken through at various points. According to their situation, we have the following varieties of urinary fistulæ:—

Urethro-vaginal,
Vesico-vaginal,
Vesico-uterine,
Uretero-vaginal,
Uretero-uterine.

The situation of these is sufficiently indicated by their names, and will be easily understood by reference to fig. 323.

A urethro-vaginal fistula rarely occurs alone, but is sometimes present along with a vesico-vaginal one. It lies in the middle line and is, naturally, of smaller size.

Pathology of Vesico-vaginal Fistula.

By far the most frequent are the vesico-vaginal fistulæ. They may occur at any point of the vesico-vaginal septum, which measures in height (from the internal orifice of the urethra to the vaginal fornix) about 5 cm. and in breadth 4 cm. (*Kaltenbach*). Their size varies from a pin-point or slit-like hole to a large oval (fig. 328) or four-cornered (fig. 338) aperture. When recent they are of larger size, but after

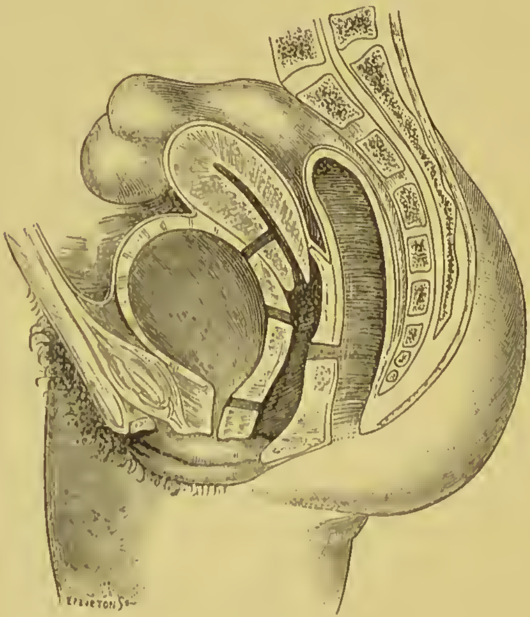

FIG. 323.

TO REPRESENT THE CHIEF VARIETIES OF URINARY FISTULA—URETHRO-VAGINAL, VESICO-VAGINAL, AND VESICO-UTERINE. Those with the ureters are not seen. The seat of a recto-vaginal fistula is indicated (*De Sinéty*).

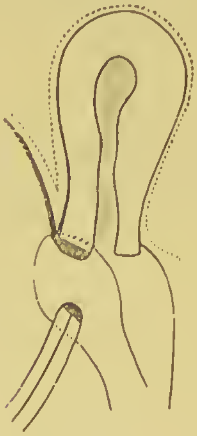

FIG. 324.

SUPERFICIAL VESICO-VAGINAL FISTULA, the Cervix is intact (*Hegar and Kaltenbach*)

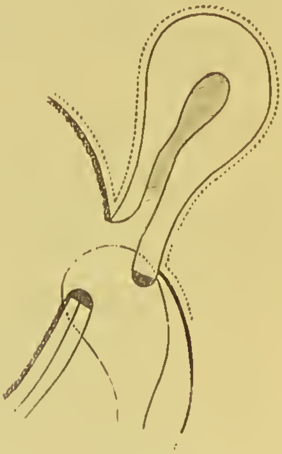

FIG. 325.

DEEP VESICO-VAGINAL FISTULA, the anterior lip of the Cervix is destroyed (*H. and K*).

some months become contracted through the formation of cicatricial tissue. The *margins* of the *fistula* are at first irregular, swollen, and ulcerated; but after a time they become thin and firm, through cicatrisation: these changes have an important bearing on treatment. Jobert divided fistulæ in the anterior fornix into *superficial* and *deep*; in the former (fig. 324) the anterior lip of the cervix was not implicated, in the latter it was more or less destroyed (fig. 325). It cases of fistulæ which allow a free flow of urine, the *bladder* becomes permanently contracted and its walls thickened; in large fistulæ, the mucous membrane protrudes through the opening and is easily recognised from its deep red colour. The normal relation of the openings of the *ureters* to that of the urethra and to the cervix uteri (fig. 326) renders them liable to be involved in an extensive fistula, or even in a small one lying to one side of the middle line. Sometimes we can recognise their openings on the exposed vesical mucous membrane by means of the urine trickling from the orifices; should the urine be blood-stained, it can be distinguished from blood by its acid reaction to test paper. The *urethra*, through disuse, becomes contracted; sometimes complete atresia is present and seriously complicates treatment, and a portion of the canal may even be completely destroyed by pressure (*v.* fig. 342). The *vagina* is often contracted by cicatricial tissue originating from injuries received during labour. The margins of the fistula are often drawn apart, and sometimes fixed down to the bone, by these cicatrices; this interferes with their closure. Contraction of the vagina below the fistula sometimes makes it impossible to ascertain the condition of the upper part and whether the uterus communicates with the fistulous tract. The

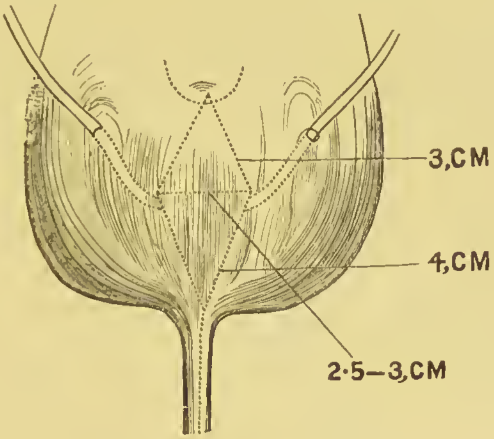

FIG. 326.

THE NORMAL RELATION OF THE CERVIX, THE URETERS, AND THE URETHRA (*H. and K.*). From cervix to orifice of ureter measures 3 cm., from orifice of ureter to that of urethra measures 4 cm., from orifice of one ureter to that of the other measures 2·5 to 3 cm. The ureters run through the bladder wall in an oblique direction downwards and inwards, for from 1·5 to 2 cm.

relations of the *peritoneum* to fistula are shown in fig. 327, from which it is evident that only in the repair of very extensive fistulæ would its relations require to be considered. The difficult labour which leads to the production of the fistula is liable to be followed by puerperal peritonitis or cellulitis; these may disturb the normal relations of the peritoneum.

Vesico-uterine fistulæ are rare. From their position they can be recognised only after dilatation of the cervical canal (*v.* fig. 323), and it is evident that they must be very small.

Uretero-vaginal fistulæ are situated in the fornix vaginæ. They are of small size, admitting only the point of the sound, and have either sharp edges or open at the point of a small papilla.

ETIOLOGY.

Malignant disease is the most common cause of fistula (*v.* p. 479); but we place this form aside, as it is beyond treatment and merely indicates a stage in the progress of the malignant growth.

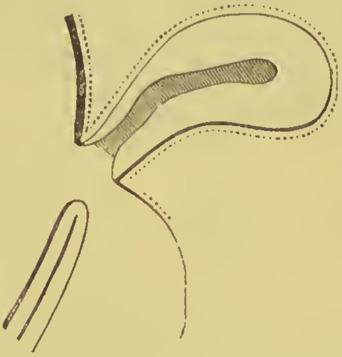

Fig. 327.

Relations of Peritoneum, indicated by dotted line, to a fistula which has destroyed the whole of the anterior wall of the cervix and the infra-vaginal part of the posterior wall (*H. and K.*).

Mode of production of Fistula in Labour.

The most important cases of fistula which we have to consider here, arise through *injury received during labour.* This injury may act *directly*, producing laceration of the septum; more frequently it acts *indirectly*, producing necrosis secondary to pressure or inflammation. The causes which predispose to fistula are a narrow pelvis and pendulous abdomen, a firm or large head (hydrocephalic), and face presentations. The immediate cause is the compression of the soft parts between the child's head and the bony wall of the pelvis; if this pressure continues for a long enough time, it destroys the vitality of the soft parts which afterwards separate as a slough.

Fistulæ produced by instruments are situated in the lower part of the vagina, and are accompanied by extensive cicatrices and adhesions; those due to pressure of the fœtal head are in the upper part. In craniotomy, the soft parts have been sometimes lacerated by the instruments, or by splinters of fœtal bone. Forceps are often cited as a cause of the injury. It is not however *the use* of the forceps after a prolonged labour which is to blame, but the *not using* of them at an early period—before the parts have been destroyed by pressure.

Fistulæ have followed diphtheritic inflammation in the puerperium, but this is rare. Inflammation and ulceration round badly-fitting pessaries have also produced them. Ureteric fistulæ may result from injury to the ureter in the operation of vaginal hysterectomy.

SYMPTOMS.

The leading symptom is the *involuntary flow of urine* from the vaginal orifice. *This will not appear until the slough separates*, that is till about the third or fourth day; its separation may be delayed for three or four weeks, when the necrosis is secondary to puerperal vaginitis (*Byford*). When a direct laceration has been produced, the urine will flow *at once* per vaginam; but even here it may escape notice till the second or third day, as it is masked by the lochial discharge.

The power of retaining varies, in certain cases, with the position of the patient; with a fistula situated high up, the erect posture allows the lower portion of the bladder to be used, though the flow is continuous in the recumbent posture. With a urethro-vaginal fistula, there may be perfect continence from a sphincter-like action of the muscular fibre in the wall of the urethra; the patient observes, however, that the urine does not pass by the urethral orifice.

Secondary symptoms are due to a constant wetting of all the surrounding parts with the urine. The urinous *odour* is quite characteristic in urinary fistula; there is *excoriation* round the vulva, the inside of the thigh is red and irritated. *Menstruation* is generally in abeyance, returning after the fistula has been cured. There is usually *sterility*; although cases of conception, often followed by abortion or premature labour, have been recorded. The disagreeable surroundings interfere with the appetite and digestion; there is *constipation*, which Freund has ascribed to increased secretion by the kidneys, but which is more probably due to reflex contraction of the muscular fibre of the rectum (*Winckel*). The general health thus becomes seriously impaired so that the patient is willing to submit to any operation which promises relief.

DIAGNOSIS.

The irritated appearance of the external genitals with the characteristic odour at once indicates that there is a fistula, but the diagnosis of its position is often very difficult.

Urethro-vaginal and *vesico-vaginal*. *When large*, these may be felt by the examining finger; on our passing the sound into the bladder the finger touches it through the fistula. The speculum shows their position and extent, and reveals smaller ones which escape detection with the finger; by stretching the folds of the mucous membrane with tenacula, we may detect a fistula concealed by them.

To recognise *small vesico-vaginal* fistulæ and to differentiate them from the *vesico-uterine* and *ureteric*, proceed as follows: pass Sims' speculum, carefully wipe away all mucus from the anterior vaginal wall, clear out the cervical canal with a dressed sound and plug it with a pledget of dry cotton wadding; now pass a catheter, and through it distend the bladder slowly with a coloured fluid such as sterilised milk or permanganate of potash; as the bladder distends, watch carefully the anterior vaginal wall for any oozing of the fluid. If there is no oozing, the fistula is not vesico-vaginal. If on withdrawing the plug from the cervix it be found stained with fluid, the fistula is *vesico-uterine.* If neither of these forms be present, the urine must come from a *ureteric* fistula; the rarity of this form should lead us to suspect that the fluid may have been temporarily kept from escaping from the bladder by a valvular action of the mucous membrane, and the examination should be repeated after a time. In a case of uretero-uterine fistula, Bérard collected the urine which escaped per vaginam in one vessel and that in the bladder was drawn off per urethram by a catheter into another; the quantities in a given time were found to be equal. His conclusion was that he had obtained the secretions from each kidney separately, so that the fistula was ureteric. Cystoscopic examination of the bladder will enable us to see directly whether urine is entering the bladder from both ureters.

PROGNOSIS.

A natural cure will depend on the recentness of the fistula and its size. Small fistulæ, if kept clean, heal of themselves during the puerperium. Large ones require *operative treatment;* cure by this means depends partly on the size of the fistula, but more on the condition of its margins—whether they contain much cicatricial tissue, and whether they are bound down.

TREATMENT.

There are two essentials for successful operative treatment: (1) complete exposure of the fistula, so that (2) the edges may be thoroughly pared and carefully adapted with sutures. The great difficulty lies in the inaccessibility of the field of operation, to which the failure of the older operative measures is chiefly to be attributed.

Marion Sims (1849) first rendered successful treatment really possible by the complete exposure of the fistula with his *speculum*, and by the *careful adaptation* of its margins with *silver-wire sutures.* Since the introduction of *catgut*, it has to a large extent displaced silver wire in this operation as it does not need to be removed subsequently. To Simon of Heidelberg is due the credit of having elaborated the operation, and of having extended its sphere so that almost no form of fistula has in his hands proved incapable of treatment. We may shortly contrast the methods adopted by these two operators as follows: Sims pared the edges of the fistula in a sloping manner (fig. 330) carefully avoiding the mucous membrane of the bladder, then adapted the margins of the fistula with silver wire, and drained the urine continuously per urethram through a catheter: Simon pared away the edges vertically not specially avoiding the mucous membrane of the bladder, united the edges with

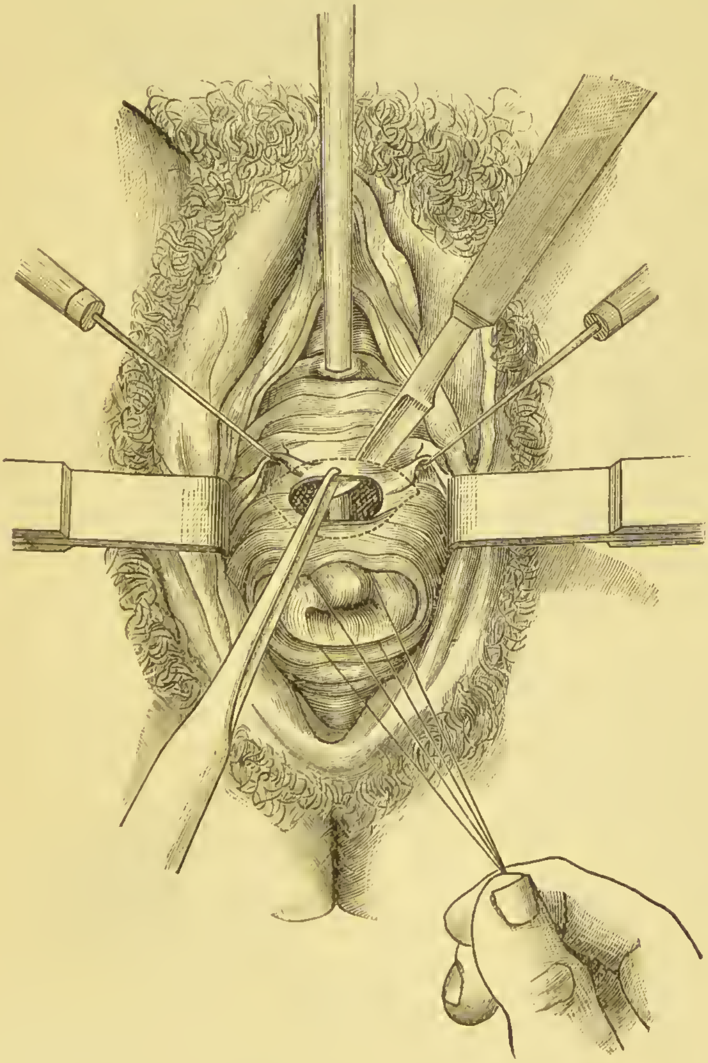

FIG. 328.

METHOD OF PARING THE EDGES OF A FISTULA (*Simon*).

silk sutures, and encouraged the patient to pass water unaided from the first—drawing it off with the catheter only when necessary. Bozeman, a pupil of Sims, drew attention to the advantages of the genupectoral posture in operating and to the importance of preparatory treatment by

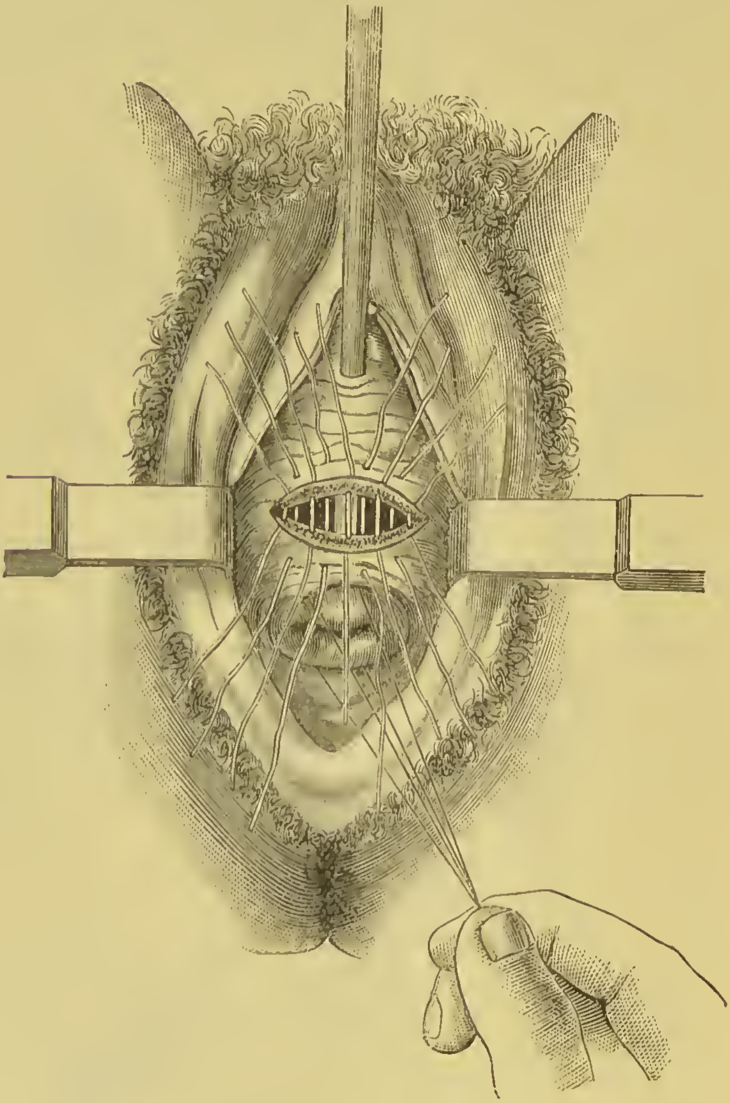

Fig. 329.
Sutures passed in a Case of Urinary Fistula (*Simon*).

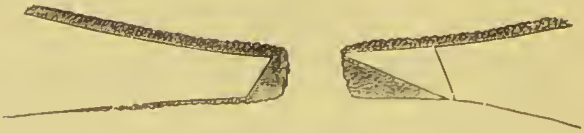

Fig. 330.
Sims' and Simon's Method of paring the Edges of Fistulæ Contrasted: Sims' is shown on the right, Simon's on the left. The mucous membrane of the bladder is above, that of the vagina is below. The edges may be pared first according to Sims' method, and if a sufficient raw surface is not thus obtained the tissue can be removed up to the fine line (*Kaltenbach*).

dividing and stretching cicatricial contractions; he fixed the sutures with lateral plates and buttons.

When a fistula has been discovered during the puerperium, our first aim is to *aid the natural effort at cure.* A catheter (fig. 343) is placed in the urethra to carry off the urine by the natural passage; the vagina is syringed out frequently with warm water; the edges of the fistula may be kept together, in some cases, by tampons suitably placed in the vagina.

If the fistula does not close by the natural process, we have recourse to operation.

Operation for Vesico-vaginal Fistula.

There is difference of opinion as to the *time for operating.* According to Hegar and Kaltenbach, the best time is six to eight *weeks* after the confinement; "the lochial discharge has ceased, the necrosis of the tissues is defined, the margins of the fistula are vascular and juicy and are at the same time of sufficient firmness to hold the sutures"; the cicatricial tissue which forms round the margins makes the operation more difficult afterwards. Marion Sims delayed the operation for a few months.

Under the operation we shall describe—

1. Preparatory treatment;
2. The operation, which consists of (1) rawing the margins of the fistula by (*a*) paring, (*b*) splitting, or (*c*) making a flap; and (2) the adaptation with sutures;
3. After-treatment.

1. *Preparatory treatment* is only necessary when there are cicatricial bands drawing the margins of the fistula apart or contracting the field of operation. These must be divided and made to heal over a glass plug, or the vagina must be kept distended with air-bags. Frequent vaginal injections are necessary in all cases, to bring the edges into as good condition as possible.

2. For *the operation* itself the following instruments are required—

Sim's or Fritsch's speculum,
Spatulæ,
Three or four tenacula,
Blunt-hook,
Vaginal douche for continuous irrigation,
Hot water to check hæmorrhage,
Dissecting and artery forceps,
Small bistouries straight or set at an angle—on long handles,
Bozeman's scissors,
Several small sponges or swabs, and sponge-holders,
Short curved needles and needle-holder,
Curved needles on fixed handles,
Catgut or silkworm-gut.

Good light is essential, and as *complete exposure* of the field of operation as is possible; this last will determine the *position* of the patient, according as Sims' or the lithotomy posture allows us to get more readily at the fistula. The drawing down of the cervix with volsellæ or sutures (fig. 328), or the protrusion of the edges of the fistula by a catheter in the bladder, is of use in some cases; where the mucous membrane of the bladder (by prolapsing through the fistula) comes in the way, it can be kept back by the sound in the bladder or a sponge probang pushed through the fistula.

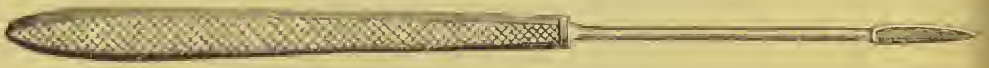

FIG. 331.

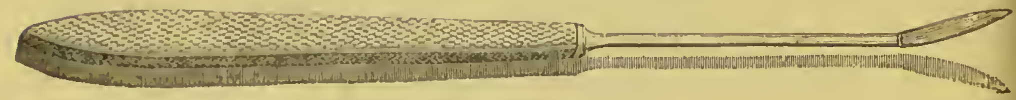

FIG. 332.

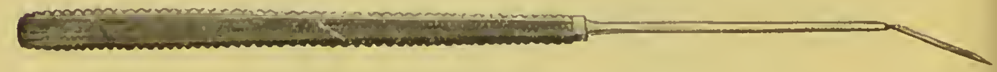

FIG. 333.

KNIVES FOR PARING A FISTULA. Fig. 331, straight knife; fig. 332, bent knife, which is shown laterally at fig. 333 (*Sir J. Y. Simpson*).

Chloroform is always an advantage, as it gives the operator more freedom in exposing the parts and prevents the patient from moving; the actual pain of the operation does not demand it.

Three *assistants* are needed—one to give chloroform, a second to hold the speculum, a third for the sponges; six are better, as two are required with the patient in the lithotomy posture and there is one to take charge of the instruments. The knives employed are shown at figs. 331-333. The sponges (or swabs) should be very small and fitted on holders of which a convenint form is shown at fig. 334. Fixed *needles* are required when the tissue is dense.

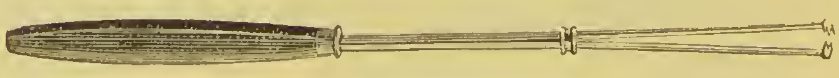

FIG. 334.

SPONGE-HOLDER.

(*a*) *The paring of the edges of the fistula.* To produce union, it is essential to have a *continuous raw* surface all round the margin. To procure this, we hook up with a tenaculum the portion of vaginal mucous membrane to be removed and transfix it with the knife (*v.* fig. 328).

The knife should not pass through the mucous membrane of the bladder, unless there be so much cicatricial tissue that a large piece requires to be cut out; the reason for avoiding the vesical mucous membrane is to prevent after-hæmorrhage into the bladder. In small fistulæ we can remove the tissue in a ring and thus ensure a continuous raw surface.

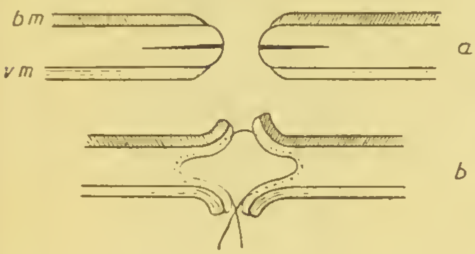

FIG. 335.

a. Incision for splitting the margins of a Fistula; *b.* Free edges turned towards the bladder and vagina respectively; *b m.* Bladder mucosa; *v m.* Vaginal mucosa.

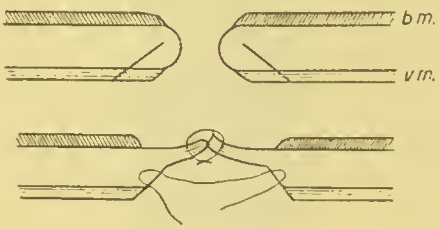

FIG. 336.

a. Incision for taking flaps from the vaginal aspect of a fistula; *b.* Flaps turned in towards the bladder, and united at their margins by deep sutures, the raw surface towards the vagina being drawn together by more superficial ones.

(*b.*) Another method of making a raw surface is to *split the edges* of the fistula (fig. 335), so that the vesical mucous membrane is separated from that of the vagina. The advantage is that no tissue is lost, but the stitching is less accurate.

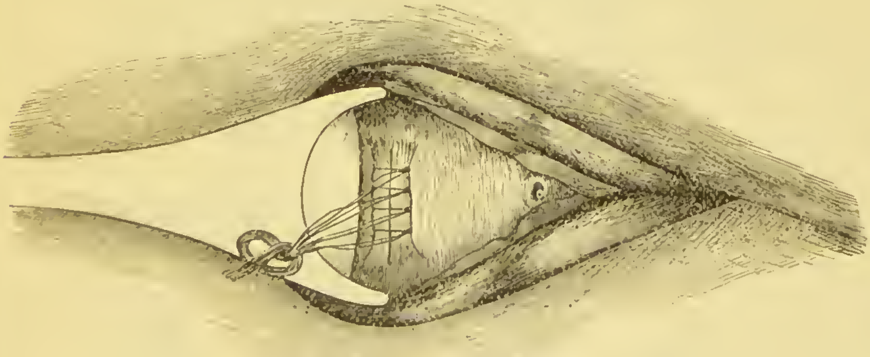

FIG. 337.

SPECULUM PASSED FOR REMOVAL OF SUTURES; the patient is on her side (*Sir J. Y. Simpson*). The sutures are usually cut short, instead of being left long as in this figure.

(*c.*) Still more tissue can be gained to bridge across the gap by the *flap operation.*[1] Here an oblique incision is made as for rawing the edges, only it stops short of the bladder-margin of the fistula (fig. 336).

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[1] Ferguson—*loc. cit.*

The flaps formed are turned in towards the bladder, which thus comes to have a strip of vaginal mucosa as part of its lining along the wound,

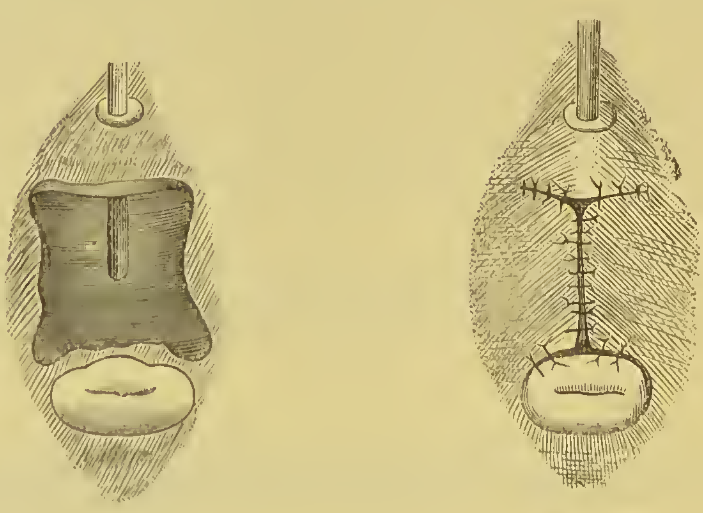

Fig. 338. Fig. 339.

Four-Cornered Fistula, fig. 338, closed by Sutures in fig. 339 (*Hegar and Kaltenbach*).

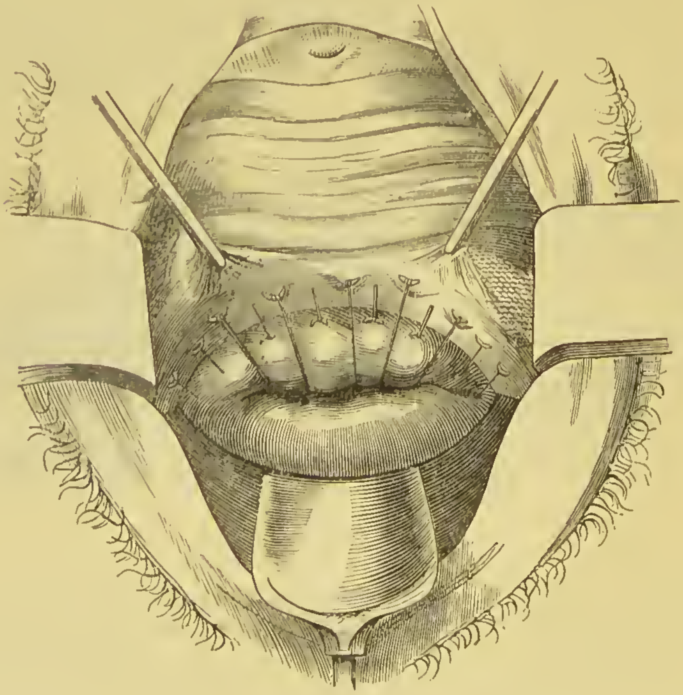

Fig. 340.

Sutures passed through anterior Lip of Cervix so as to close in transversely a Fistula of the Anterior Fornix (*H. and K*).

which is united by a buried suture. The raw surface towards the vagina is then drawn together by a continuous catgut suture.

Hæmorrhage is best checked by hot douche; large bleeding points may require twisting or even ligature.

Passage of Sutures.

(*b.*) *The adaptation of the edges with sutures* must be carefully done. The sutures must be pretty close together, and should either not pierce the vesical mucous membrane or should take in only its margin.

After all the sutures are passed, they are tied. With a triangular fistula the closed wound will be Y-shaped, while a quadrilateral fistula will give an I-shaped wound (figs. 338, 339).

Fistulæ close to Cervix.

In the case of fistulæ situated close to the cervix, we make use of the anterior lip to close the fistula; the result is a crescentic wound (fig. 340). Sometimes we have to excise a portion of the cervix to get a sufficient raw surface (fig. 341). When much of the anterior lip is destroyed, it may be necessary to use the posterior lip to close the fistula (*see* fig. 325, and compare it with fig. 324); in this case the uterus will communicate with the bladder and the menstrual blood be discharged per urethram.

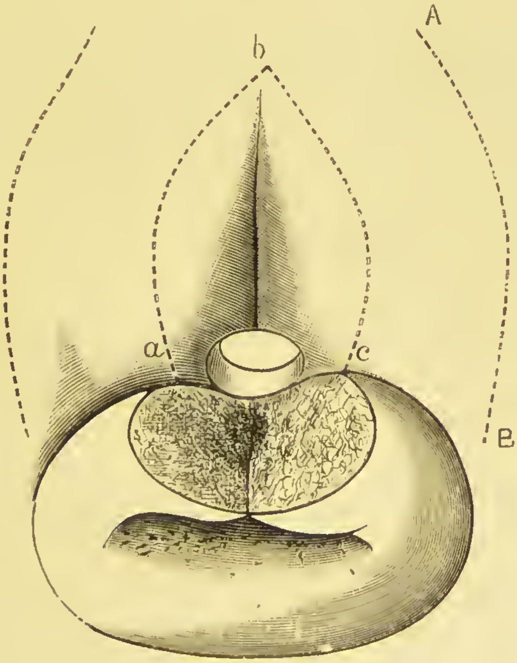

Fig. 341.

Anterior Lip Divided to close in Vertically a Fistula close to it: *a b c* shows extent of surface, round the oval fistulous opening, to be made raw; the mucous membrane may have to be incised outside the sutures, along the line *A B*, to relieve tension (*Emmet*).

Vesico-Uterine Fistula.

For *vesico-uterine* fistulæ, the best method is to dissect the bladder off the cervix until the fistula is fairly exposed.[1] It is then closed with sutures as is also the corresponding opening of the fistulous tract in the cervix, and finally the wound in the fornix.

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[1] Champneys and Mackenrodt—*loc. cit.*

When there is a *urethral* as well as a vesical fistula, the *former must be closed first*: when there is *atresia* of the urethra, the free margins of the urethral wall above and below are pared and united by sutures so as to bridge over the atresic portion (fig. 342); the vesical fistula is obliterated by a second operation.

Where the margin of a fistula has become cicatrised to the pubic bone, an incision is made in the labium of the corresponding side,[1] and the adherent tissues separated from the bones; and the fistula then treated in the usual way. Where there is a great defect of tissue, the uterus has been called into requisition to fill up the gap.[2]

Trendelenburg recommends that in cases where the fistula cannot be satisfactorily treated per vaginam, a transverse supra-pubic incision be made dividing the recti and reaching the pre-vesical tissue. The bladder is opened into transversely and, if the patient be in the Trendelenburg posture, air enters and distends it. The edges of the fistula, now freely exposed, are denuded in such a way that more tissue is removed from the vesical than from the vaginal mucosa. Silkworm gut sutures, each one threaded on two needles, are passed through the edges, and tied in the vagina. A small opening is left in the fundus of the bladder, in which a drainage tube is placed for a few days, the patient meanwhile being kept lying in Sims' position. In four or five days the tube is removed, and the bladder and abdominal wound allowed to close. This method will be found very useful in dealing with fistulæ in the neighbourhood of the ureter and cervix, and also in vesico-uterine fistulæ.

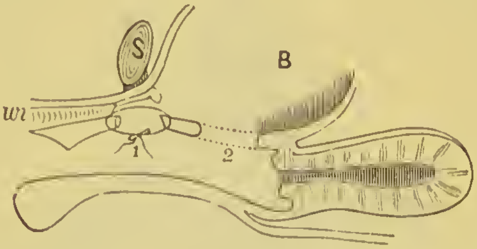

FIG. 342.

VESICAL FISTULA + Atresia of a portion of the urethra *ur* just below the symphysis *s*. The latter is first bridged over at 1 and then the vesical fistula closed in at 2 (*Winckel*).

After-treatment.

3. *After-treatment.* When the operation has been done *per vaginam* a stationary catheter is placed in the bladder—of the ordinary winged form or those shown at figs. 343, 344. The urine is collected in a long narrow vessel (as a soap-dish) passed between the patient's thighs; two catheters are required, so that they may be changed every day as the salts of the urine readily occlude the tube; the one not in use should

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[1] As recommended by Schauta—Ueber die Oper. fixirter Blasenscheidenfisteln: Monats. f. Geb. u. Gyn. Jour., 1895.

[2] As by W. A. Freund (Sam. klin. Vorträge, N. F., No. 118, 1895), and v. Rosthorn (Cent. f. Gyn., 1896, S. 107).

be kept thoroughly clean. As mentioned above, the bladder is drained through the abdominal wound when the operation has been performed by that route.

After-dangers of Operation.

The after-dangers of the operation are hæmorrhage into the bladder and vesical catarrh. The former is a troublesome complication, as the blood-clots collect in the bladder; when there is marked hæmorrhage distending the bladder, the fistula must be opened up again. Sometimes the ureter has been caught in a stitch and compressed; intense pain, shooting from the kidney downwards along the course of the ureter, with vomiting and other symptoms of uræmia follow, but pass off on relaxing the sutures.

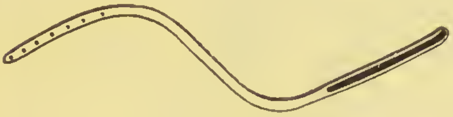

FIG. 343.

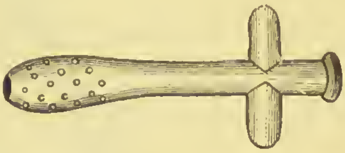

FIG. 344.

SIMS' STATIONARY CATHETER: fig. 343, first model; fig. 344, later model. That in fig. 343 is made of block tin so that it can be bent to any curve; when *in situ*, it must be bent so that the external end has its groove uppermost: that in fig. 344 is of rubber and has tubing attached to it.

Removal of Sutures.

The sutures, when not of catgut, are removed on the tenth day. The method of removing sutures is shown at fig. 337.

For cases of fistulæ incurable by operation, a rubber urinal may be fitted on to an ordinary ring pessary;[1] or better still on to a spoon-shaped metallic collector.[2]

URETERIC FISTULA.

In cases of ureteric fistulæ, the end of the ureter next the bladder is tied, while that towards the kidney is implanted into the bladder. One end of a gum elastic catheter is passed into the ureter to define it and facilitate the stitching of it into the bladder. An elliptical incision is made in the bladder near the usual insertion of the ureter; or if the ureter be short, at the nearest point. The catheter is now passed through this wound into the bladder and out through the urethra; and the ureter carried on it into the bladder wound into which it is fastened—the sutures which close the wound passing also through the wall of the ureter so as to fix it in the wound.[3]

Witzel[4] describes a case in which he did abdominal section so as to get down on the ureter extra-peritoneally. Then instead of dissecting it out, so as to bring it nearer to the bladder, he dissected off the bladder so as to drag it over towards the ureter, and thus allow the latter to be introduced obliquely through its wall.

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[1] Jay—Amer. Journ. Obstet., 1887, p. 50.

[2] Bozeman—*ibid.*, 1892. i., 544.

[3] This is Boldt's procedure (*Op. cit.*). He got access to the bladder by abdominal section. This has also been done by the vaginal route. Boldt's paper describes various methods and gives the literature.

[4] Extra peritoneale Uretero-cystostomie mit Schrägkanalbildung. Cent. f. Gyn., 1896, S. 289.

Kelly[1] describes an interesting case, in which he got access to the ureter through the peritoneal cavity, and implanted it in the bladder.

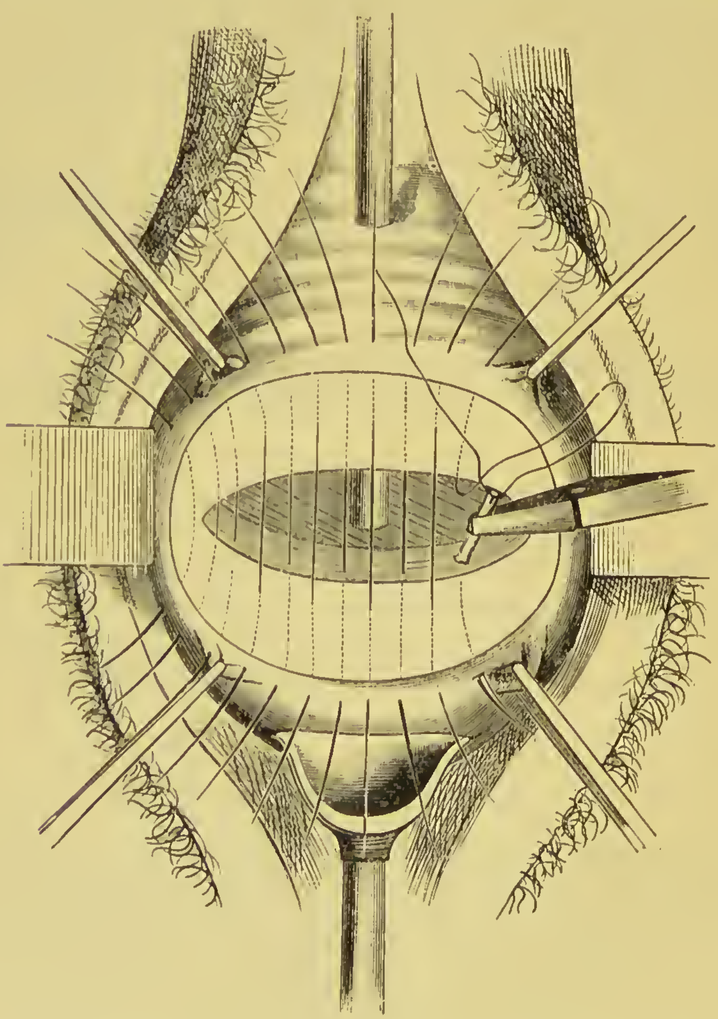

Fig. 345.

Simon's Operation for Kolpokleisis. The patient is in the lithotomy posture; the sound has been passed through the urethra and fistula, and is seen in the upper portion of the vagina: the perineum is drawn back with the speculum and the labia marjora with spatulæ. A band-like piece of tissue has been removed from both the vaginal walls above the ostium; the raw surface is left unshaded in the figure. The vaginal mucous membrane is held tense by four pairs of forceps outside the raw surface, the shaded area within the latter is the upper third of the vagina. An end of the last suture has been passed through one raw surface, the second end is being carried through the other raw surface (*H. and K.*).

The bladder had to be dissected from its attachments to the horizontal rami of the pubis, to allow the ureter to be approximated without strain.

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[1] Operative Gynecology, Vol. i, p. 461.

Closure of the Vagina: Kolpokleisis.

Where direct closure of the fistula is impossible, the only means for relieving the patient's discomfort is closure of the vagina below the fistulous opening. The portion of the vagina above this becomes, as it were, an extension of the bladder; the menstrual blood is discharged with the urine.

Vidal De Cassis, who originated this operation, performed it as follows. The inner surfaces of the labia majora were pared and brought together by sutures: the vulva was thus closed in an *antero-posterior* direction. After this operation, there always remained just below the urethral orifice a small cleft through which the urine trickled. Unless complete continence is obtained, such an operation is useless.

Simon's Kolpokleisis.

Kolpokleisis is the name given to the operation introduced by Simon. It consists in obliteration of the vagina *transversely* by making a raw surface on its walls above the level of the ostium vaginæ. It is evident that this operation is justifiable only where closure of a fistula is impossible, either through the binding down of its margins to the bone with cicatricial tissue or through the complete destruction of the urethra. As the closure of the vagina interferes with married life, the nature of the operation should be explained to the patient beforehand, and full permission obtained.

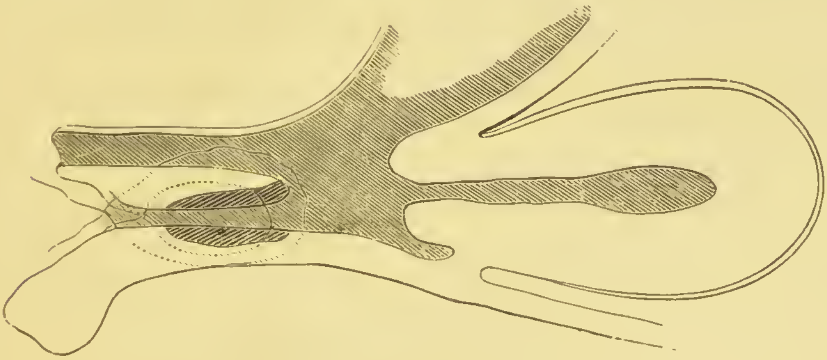

Fig. 346.

Same Operation as seen in Section to show relation of Raw Surfaces (shaded dark), position of sutures and common receptacle above for urine and menstrual blood. The bladder and urethra are in upper part of figure (*H. and K.*).

The operation is performed as follows. By pinching up the mucous membrane, ascertain where it is most lax, so that the vaginal walls can be easily approximated; the point of closure should be as high up as possible. Mark out with the knife the ring of tissue to be excised. Lay hold of its lower margin and dissect it from below upwards; with the finger in the rectum and the sound in the urethra, we can judge of the thickness of tissue to be removed (compare fig. 345 with fig. 346). On each ligature of catgut or silk, two small curved needles are threaded so that *both* ends of the thread may be passed *from above downwards.* The needle must be entered into the vaginal mucous membrane above, carried through the substance of the vaginal wall (without appearing in the wound), and brought out through the vaginal mucous membrane below; it is difficult to prevent these sutures from catching up either bladder or rectum, but this should, if possible, be avoided. Care is required in the introduction of the first mesial suture as it is the guide for the others.

The results of this method are satisfactory as regards the production of complete continence. There is no liability to stagnation of urine or formations of concretions (*Hegar and Kaltenbach*). Hæmatometra will not occur unless there has been atresia of the cervix uteri. If menstruation has been in obeyance, it will probably return after the operation; in a case operated on by A. R. Simpson, the patient had not menstruated for a year, but a few weeks after the operation the menstrual blood appeared in the urine.

CHAPTER LV.

THE RECTUM; COCCYGODYNIA.

LITERATURE.

Allingham—Diseases of the Rectum: Churchill, 1871. *Chadwick*—On the Functions of the Anal Sphincters: Am. Gyn. Trans., 1877. *Cripps*—Cancer of the Rectum: Churchill, 1880. *Hart*—Physics of the Rectum and Bladder: Edin. Obst. Trans., 1882. *Ruedinger*—Topographisch-chirurgische Anatomie des Menschen, Vierte Abtheilung: Stuttgart, 1873. *Storer*—The Rectum in its relation to Uterine Disease: Am. Jour. of Obst., Vol. i., p. 66. *Syme*—Diseases of the Rectum: Edin., 1859. *Van Buren*—Diseases of the Rectum: H. K. Lewis, 1881.

Not only is the gynecologist frequently consulted about rectal mischief, but as a matter of fact female patients sometimes refer rectal disease to the uterus or vagina; therefore, in investigating gynecological cases, one has occasionally to satisfy one's self that the rectum is not the seat of the affection.

Vaginismus may be caused by fissure of the anus, as we have already seen, and pruritus vulvæ by ascarides from the rectum passing into the vagina.

PHYSIOLOGY OF THE RECTUM.

Relation of Rectal, Vaginal, and Urethral Axes.

The anatomy of the rectum has been already considered (p. 38). The relations of the axes of rectum, anus, vagina and urethra, to one another and to intra-abdominal pressure are of importance. As we have already seen, the vagina and urethra are parallel to one another and to the plane of the brim.

Strictly speaking the surface whose outer boundary is the brim of the bony pelvis is not a plane surface, inasmuch as the various points in the outline of the brim are not on the same level. The vagina is thus, properly speaking, parallel to the internal conjugate of the brim.

The rectum runs, in part of its course, close behind the vagina for 1½ inches and parallel to it; the anal canal turns directly backwards so as to cut the vaginal axis at right angles. Intra-abdominal pressure acts at right angles to the vaginal walls, as can be noted from the fact that in defæcation the Hodge pessary is not driven out of the vagina. Consideration of fig. 347 will show that the direction of intra-abdominal pressure on the pelvic floor coincides with the long axis of the anus, so that intra-abdominal pressure will act with its full driving force on any body in the anal canal.

Mechanism of Defæcation.

The mechanism of defæcation is probably the following. According to Hilton, in his now classical book on "Rest and Pain," the lower part of the rectum is sensitive, but the upper two-thirds are but slightly so; the rest of the large intestine and the small intestine are non-sensitive. Hilton limits the sensitive portion to the lowest two inches of the rectum—to the part below the so-called sphincter tertius. When there is accumulation of fæcal matter in this portion, pain and uneasiness produce the desire to expel these contents. There result the following reflex movements:—

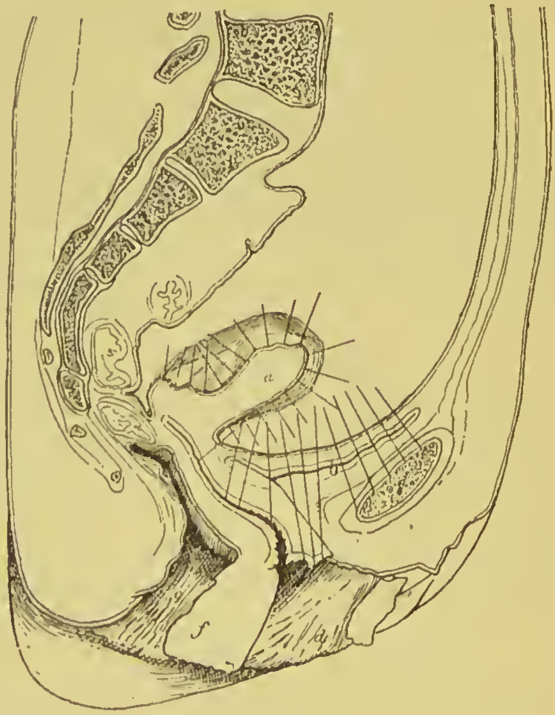

FIG. 347.

TO SHOW DIRECTION OF RECTUM AND OF ANUS IN RELATION TO INTRA-ABDOMINAL PRESSURE. *a*, uterus, *b* bladder, *d* vaginal orifice, *f* perineum.

(1) Relaxation of the sphincter ani;
(2) Peristaltic contraction of the circular unstriped muscle;
(3) Shortening of the longitudinal muscle with eversion of the mucous membrane — since the longitudinal fibres have a fixed point below, their contraction will probably pull the rectum more into the line of the anal axis;
(4) Contraction of the segments of the sphincter tertius.

In this way the lowest portion of the rectum becomes roofed in above by the sphincter tertius and open below. Intra-abdominal pressure drives this portion downwards; and the rectal contents, elongated by peristalsis and depressed by intra-abdominal pressure and eversion of the mucous membrane, are finally brought into the relaxed anal canal from which intra-abdominal pressure readily expels them. The levator ani reinverts the everted mucous membrane.

Inattention to the proper evacuation of the bowels leads to non-sensitiveness of the mucous membrane and is thus one factor in constipation.

EXAMINATION OF THE RECTUM.

This may be done in four days :—

(*a*) By finger (*v.* p. 103),
(*b*) By speculum,
(*c*) By eversion of the anterior rectal wall through digital pressure in the vagina (*Storer*),
(*d*) By posture.

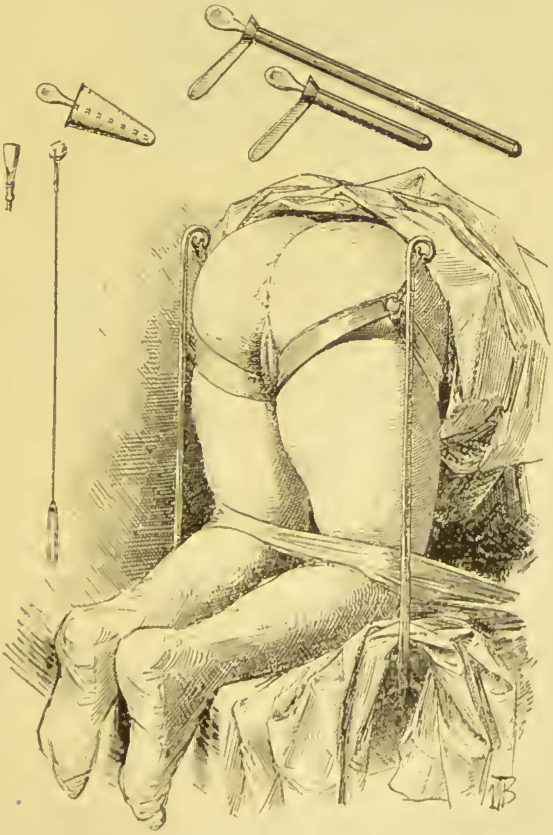

Fig. 348.
Postural Examination of the Rectum with instruments required (*Kelly*).

By Speculum. The ordinary anal speculum has an oval fenestra ; it is passed into the anus in the direction of its long axis, and rotated so that each portion of the anal lining comes opposite the aperture (fig. 350).

Specular Examination of Rectum.

Storer's Method.

Storer's method is as follows. Place the patient on her side; pass two fingers (or one) half way into the vagina, with the pulps of the fingers on the posterior vaginal wall. Then press these downwards and backwards, and thus evert the rectal mucous membrane through the dilatable sphincter ani which is at the same time pressed open with the fingers of the other hand. This method is most easily employed in multiparæ.

Kelly has applied the principle of *postural* examination, so as to allow distension with air, which has proved so useful in the case of the bladder, to the rectum. The patient is placed in the genupectoral posture, supported by uprights and straps (*v.* fig. 348), although these are not always necessary, or in the lithotomy posture with the hips raised. Sometimes preliminary stretching of the sphincter by a conical dilator is required. A short speculum (proctoscope) is used for the examination of the rectum, and a longer sigmoidoscope (14 inches long) to reach the sigmoid flexure. A long swab-holder is required for introducing small pledgets through the speculum to cleanse the areas under examination. These necessary instruments are shown in fig. 348.

DISEASES OF THE RECTUM.

Women are especially liable to rectal disease from the distension of parts accompanying parturition, as well as from their habitual neglect of the regular evacuation of the bowels. As rectal diseases often simulate those of the vagina, a sketch of the more important of them is necessary in a Manual of Gynecology. We shall therefore consider the following affections:—

Displacements of the rectum,
Fissure of the anus,
Piles,
Recto-vaginal fistula,
Functional disturbance of rectum—constipation.

Displacements of the Rectum.

These are—Rectocele;
Prolapsus recti (*a*) of mucous membrane,
(*b*) of whole thickness of bowel.

Prolapsus Recti.

For *prolapsus recti*, which is properly surgical, *see* Van Buren or Allingham.

Rectocele.

Rectocele is a protrusion of the lower part of the anterior wall of the rectum covered by the posterior vaginal wall, into the lumen of the vagina or even through the vaginal orifice. *Etiology.* There are two factors—tear of perineal body and pressure of scybala in rectum. *Diagnosis.* The posterior vaginal wall is seen protruding into the vagina or out at the vaginal orifice. The diagnosis is made by noting the relations of the protruded vaginal wall and by passing the finger through the anus into the pouch (fig. 349). *Treatment.* The patient should wear in the vagina a Hodge or Albert Smith pessary with cross bars; explain the necessity of a regular daily evacuation of the bowels.

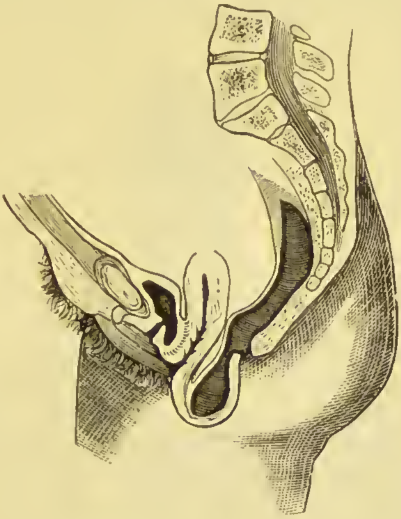

FIG. 349.
RECTOCELE (*Schroeder*).

Fissure of the Anus.

Fissure of Anus.

This is a crack, or ulceration, of the anal skin or of the mucous membrane covering the internal sphincter. In the edges of the crack there is usually a nerve filament, and below the crack lies the powerful sphincter ani.

This apparently insignificant lesion gives rise in most cases to an unbearable and even incredible amount of pain, lasting for hours after the bowels have moved. Hilton's explanation of this is so good that we give it entire.

Hilton's Explanation of Pain in Fissure.

"The reason for this anal ulcer being so very painful is the number of nerves associated with it; and the cause of the continued painful contraction which accompanies it lies in the enduring strength of the sphincter muscle. Thus it happens that exposure of those nervous sensory filaments upon the ulcer causes excito-motory or involuntary and spasmodic contraction of the sphincter, through the medium of the spinal marrow. The sphincter muscle contracts towards its own centre, and, as long as the muscle is in a state of contraction, it brings the sensitive edges of the ulcer into forced contact; this excites more muscular contraction, and thus by time and exercise, the muscle becomes hypertrophied, massive, and increased in dimensions."

Symptoms. *Symptoms.* The patient complains not so much of pain while the bowels are being moved as *of an unbearable pain coming on after the evacuation and continuing for some hours.* The pain is described as unendurable, causing the patient to dread and postpone natural motions. There are often iliac pains and vaginismus; this last symptom is not infrequent.

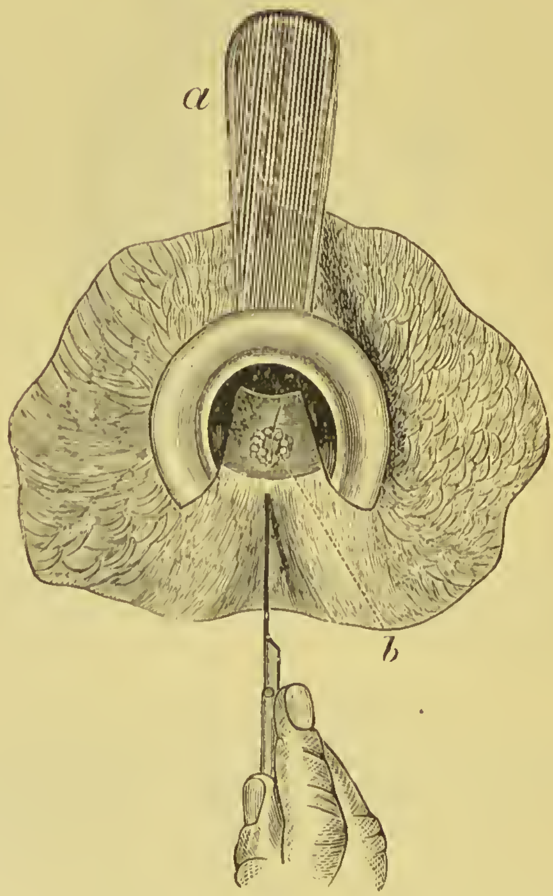

Fig. 350.

Anus *a* with Anal Speculum *in situ*; it is turned so as to expose in the fenestra a fissure *b* beneath which a tenotomy knife has been passed (*Hilton*).

Physical signs. By speculum or eversion, the crack is seen.

Treatment. *Treatment.* Chloroform the patient, pass a tenotomy knife beneath the base of the ulcer (fig. 350) and cut upwards. This divides the muscular fibre so that the irritated edges can no longer be brought together. The fissure gets rest and heals readily; a cure is thus effected.

Another and very good plan is to chloroform the patient, and introducing the thumbs (with the dorsal surfaces in contact) to stretch the anus by forcibly separating them; this ruptures the muscular fibre and acts just as the knife does, and is especially good when the fissures are multiple.

The bowels are not to be moved for a day or two; the patient has then some pain when the motion is passing, but none after it.

Piles.

Hilton has pointed out that at the anus the line of demarcation between skin and mucous membrane is marked out distinctly by "the white line," as he terms it. This line is of great practical importance, as we shall see.

Piles are small tumours at the anus, on either side of this white line. They consist of dilated veins embedded in connective tissue and covered by skin or mucous membrane. We speak of external piles, *i.e.*, those outside of the white line and covered by skin, and internal piles, *i.e.*, those inside of the white line and covered by mucous membrane. Occasionally we have, as a special form of external pile, a dilated vein outside of the white line and usually containing a clot (venous pile).

Symptoms.

Symptoms. Venous piles cause great pain; while external piles, unless inflamed, occasion little inconvenience; from internal piles, there is bleeding when the bowels are moved.

Signs.

Physical signs. The venous pile is a purplish tumour outside of the white line; external piles are like tags of skin, or are more or less distended; internal piles are cherry red and easily bleed.

Treatment.

Treatment. 1. When venous piles contain a clot, incise and turn out clot.

2. For internal piles, employ the following *palliative* treatment. Give sulphur confection when necessary.

℞ Confectionis Sulphuris ʒij
Sig. Dessertspoonful at night.

Instruct the patient to wash the parts with soap and water after each motion, and to occasionally bathe with cold water.

Order gall and opium ointment to be applied.

℞ Unguenti Gallæ c̄ Opio ʒij
Sig. As directed.

For any abrasions, order boracic ointment or bismuth and cocaine suppositories.

The *radical* operative treatment belongs more to the surgeon.

Recto-vaginal Fistula.

The situation of such a fistula is shown in fig. 323. It may be due to carcinomatous or syphilitic ulceration, or to injury received during parturition.[1] The last only can be operated on. It is usually due to a tear during labour involving the anus, the lower part of the laceration having united. The best treatment is to cut through the united portion and operate on it as if it were a rupture of the perineum involving the anus (*v.* p. 587).

Functional Disturbance of Rectum—Constipation.

Women are usually exceedingly careless in the matter of regulation of the bowels; very often, evacuation is practised once a week or even at longer intervals. The main reason for this is want of exercise.

When consulted for constipation, the medical man should first inquire into the patient's habits as to exercise, diet, and sleep. When necessary, walking, golfing, tennis, or cycling should be advised unless there are any contraindications. The fact of the patient being a woman is no contraindication to any of these, but undue exercise should be avoided at the menstrual period. The aim of the patient should be to lead a natural life. The value of a daily evacuation at a fixed hour should be pointed out; this educates the bowels to demand it regularly. All quack pills should be tabooed as dangerous. The diet should be regulated; bran bread, porridge and milk, stewed fruit, figs, etc., taken as part of food. The following pill is good.

℞ Extracti Nucis Vomicæ
Extracti Belladonnæ āā gr. $\frac{1}{4}$
Pilulæ Colocynthidis et Hyoscyami ,, iij.
Fiat pilula: mitte tales vj
Sig. One occasionally.

The nux vomica and belladonna strengthen the peristalsis of the bowel: the colocynth and hyoscyamus pill is purgative; aloes and iron pill may be substituted for it.

Cascara Sagrada is very useful. We may give a pill of one to three grains thrice daily until the bowels move; twenty drops of the liquid extract may be taken instead.

℞ Extracti Cascaræ Sagradæ gr. iii.
Pulv. Glycyrrh Co. q.s.
Fiat pilula: mitte tales xij.
Sig. One thrice daily.

℞ Extracti Cascaræ Sagradæ Liquidi ʒij.
Sig. Twenty drops thrice daily.

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[1] It has been described as a congenital condition. Torek: Cent. f. Gyn., 1895, S. 328.

This drug is tonic to the bowel; its use should be stopped when once the bowels begin to act. It should not be given until the diet is regulated. The pill is more convenient, as the liquid extract is bitter.

The purgative mineral waters are very useful. The best are the Friedrichshall, Hunyadi Janos, Apenta, and Aesculap. The patient should take in the morning a wine-glassful or half-tumblerful with an equal amount of hot water; the taste may be masked by the juice of a lemon with sugar. Rubinat is a strong and active aperient in doses of one ounce. The Carlsbad salts are good and may be used as already directed (p. 355). Very often an enema of cold water is helpful. The medical man should deprecate the habitual use of purgatives, and insist on natural and daily evacuation as the result of judicious diet, work, and exercise.

The aloes and iron pill is good in sluggishness of the lower bowel. Rhubarb is bad as a habitual purgative, owing to its tendency to constipate after purging; the well-known "Gregory's Mixture" should not be used as a habitual purgative, but is good in diarrhœa inasmuch as it first purges and then binds. Fluid magnesia, castor oil, and some of the milder salines (*e.g.*, the easily-taken Seidlitz powder) may be employed. Blue pill should be avoided; euonymin or iridin are better hepatic stimulants (*v.* p. 610).

The injection of pure glycerine (ʒj–℥j) into the rectum ensures an evacuation of the lower bowel in a few minutes; and is therefore convenient in certain cases. Suppositories made up in large part of glycerine can also be employed. A small syringe is required for the injection of the fluid glycerine. Abdominal massage is often beneficial.

COCCYGODYNIA.

LITERATURE. *Hildebrandt*—Die Krankheiten der äusseren weiblichen Genitalien, S. 127: Stuttgart, 1877. *Nott*—N. O. Medical Journal, May 1844. *Simpson, Sir J. Y.*—Diseases of Women, p. 202: Edinburgh, 1872. *Thomas*—Diseases of Women, p. 151: London, 1880.

By this we understand a painful condition in the region of the coccyx induced by sitting, walking, and the various muscular contractions associated with defæcation and coitus. When we consider the anatomy of the coccyx, its muscular attachments (to the levator ani, coccygeus, external sphincter ani, and gluteal muscles), as well as the strain put on it when driven back during parturition, we are not astonished that in some cases there should be inflammatory changes around and in it causing pain in its movement.

Symptoms. The chief symptom is pain on sitting, walking, and defæcation.

Physical signs. By digital pressure on the coccyx and examination per rectum, the seat and nature of the pain is made out.

Treatment. (1) Massage and manipulation of the coccyx should be tried first. (2) Pass a tenotomy knife beneath the skin on the posterior aspect of the coccyx, and free its lateral and apical muscular attachments; or (3) amputate the coccyx. To do the latter, make a vertical mesial incision over the posterior aspect of the coccyx; seize its tip and pull it well back; then free its muscular attachments with the knife, keeping close to the bone; finally separate it at the sacro-coccygeal joint. (2) and (3) are rarely necessary.

APPENDIX.

ABDOMINAL SECTION.

LITERATURE.

Donald, Arch.—A Case of Vaginal Cœliotomy for Tubal Pregnancy: Brit. Med. Journ., 1896, i., p. 79. *Dührssen*—Ueber eine neue Methode der Laparotomie (Köliotomie vaginale): Berl. Med. Woch., 1894, No. 4; *v.* also Zts. für Geb. und Gynäk., Bd. xxviii., S. 401. *Keith*—Surgical Treatment of Tumours of the Abdomen: Edin., 1885. *Kelly*—Operative Gynecology: Kimpton, London, 1898. *Pryor*—Gynecology: Appleton, New York, 1903. *Kocher*—Text-book of Operative Surgery, p. 126 (Stiles' Trans.): London, A. & C. Black, 1903. *La Torre*—Quel est le meilleur mode de fermêture de l'abdomen: Paris, Levé, 1897. *Langenbuch*—International Medical Congress, London, 1881, Vol. ii., p. 278. *Lister*—On Corrosive Sublimate as a Surgical Dressing: Lancet, 1884, p. 723. *Martin, A.*—Die Colpotomia anterior: Monats. für Geb. und Gynäk., Bd. ii., Hft. 2, 1895; *see* also Brit. Med. Journ., 1896, i., p. 10. *Maygrier*—Terminaison et Traitement de la Grossesse extra-utérine: Paris, 1886. *Taylor, J. W.*—On the Opening of the Abdomen from the Vagina, etc.: Brit. Med. Journ., 1896, i., p. 78. *Treves, F.*—Intestinal Obstruction: London, Cassell & Co., 1884. *Wells, Sir Spencer*—The Diagnosis of Surgical Treatment of Abdominal Tumours: London, Churchill, 1885. *See* also literature of Operative Treatment of Ovarian Tumours, Chap. XXIV.; of Fibroid Tumours, Chap. XXXVII.; and of Carcinoma Uteri, Chap. XLII.

In this chapter we consider some details as to management of abdominal section generally, particulars as to various operations having been already given.

Prior to operation the *diagnosis* must be made as exactly as possible, and all means must be taken to ensure this. Thus the history must be ascertained thoroughly, and all points in it weighed. Facts as to menstruation must be exactly obtained. If there is amenorrhœa, the fact as to its possibly depending on pregnancy must be kept in mind. For instance, hydramnios with a five months' amenorrhœa may give physical signs somewhat resembling a large ovarian cyst, and serious mistakes may arise if ballottement is not ascertained, or due importance not given to the fact that the uterus is not felt separately from the tumour. Dermoids of the ovary and fibroids of the uterus may be difficult to differentiate if the symptom of menorrhagia, so characteristic of the latter, is not noted. The blood count should be taken and the significance of leucocytosis estimated.

Even with the greatest care mistakes may happen, and thus the operator prepared for the removal of a cystic tumour should have also the instruments necessary for a hysterectomy.

General condition of the patient. Unless in emergency cases, the patient should be kept under observation so as to bring her into as good condition as possible; all her systems are examined, special attention being paid to the state of the urine as regards specific gravity, the amount in twenty-four hours, albumen, sugar, etc. The state of the heart should be investigated as to murmurs, irregular or feeble action, and, where necessary, cardiac tonics, digitalis, or strophanthus administered. In those who are anæmic—*e.g.*, in cases of fibroids—iron can be given, and the most favourable time seized for operation—viz., before a period. The bowels will require regulation, and diet should be light and nutritious. It is advisable for the patient to have a few days rest in bed prior to operation.

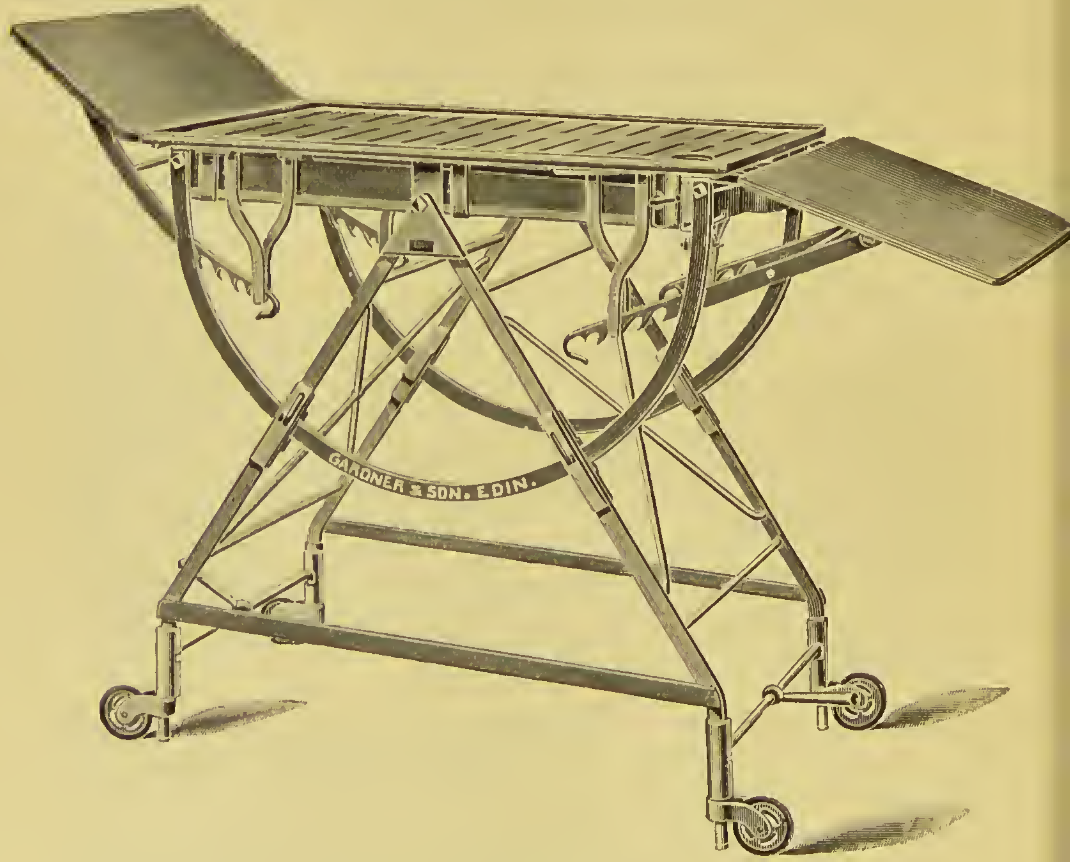
GARDNER & SON. EDIN.

FIG. 351.

OPERATING TABLE fitted for Trendelenburg posture, with hot water compartment.

The *operation* is best performed in a public or private hospital, provided with an operating room; at the same time the operation can be quite well done in a private house in a cleansed room, with superfluous furniture, carpets, and pictures removed, and where the house drainage is good. The room can be fumigated with formalin before use when necessary. A nurse who has experience of the management of abdominal operations[1] is essential.

Armamentarium. The necessary instruments should be sterilised by boiling in soda solution (carbonate); swabs are sterilised, silk boiled, and catgut bottles cleansed outside and stoppers covered with sterilised gauze.

The *operating table* should be one admitting of Trendelenburg's position (*v.* figs. 351, 352), and of being kept at a suitable temperature. All instruments and swabs must be carefully counted by the instrument clerk or nurse. It is best to write down the "count" on paper, and fix it to the wall of the theatre. The surgeon, while he must delegate the duty as we have indicated, is legally responsible for any mistake.

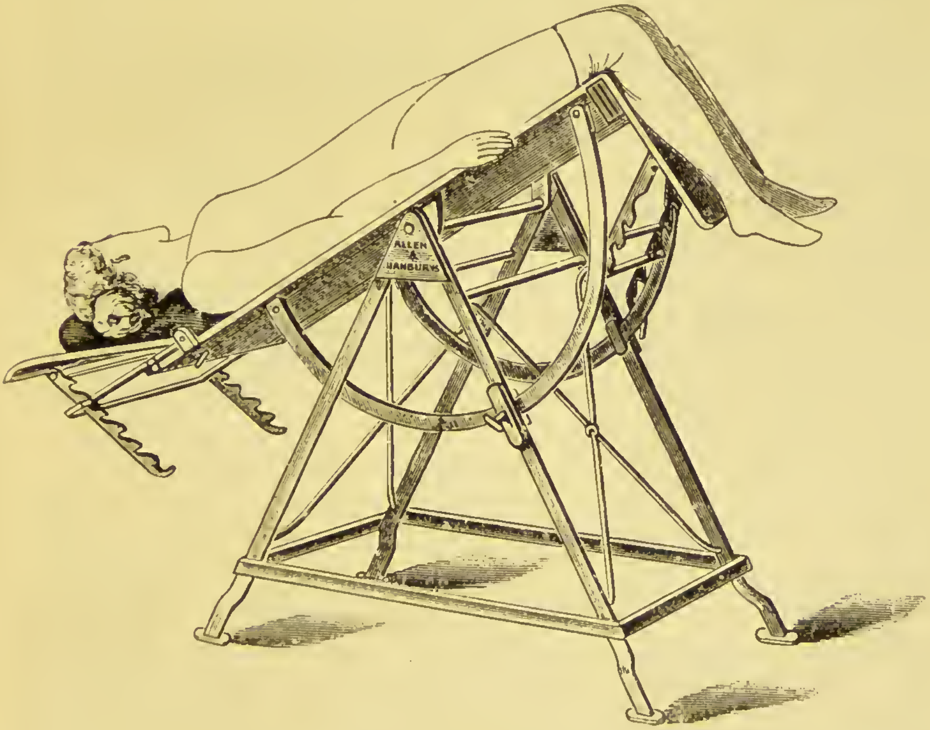

Fig. 352.

Table raised so as to bring Patient into Trendelenburg Posture.

Anæsthesia. Ether given with Clover's inhaler or some modification is probably the safest anæsthetic, but is contraindicated in lung and probably in kidney conditions. It is disagreeable to the patient at first, and thus nitrous oxide gas may be used to begin with, or chloroform may be employed to start the anæsthesia, which is continued by ether.

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[1] A useful book on "Gynecological Nursing" has recently been written by Netta Stewart, where the nurse will find much valuable information as to her duties (Edinburgh: Oliver & Boyd).

Chloroform is the most convenient and agreeable anæsthetic if not the safest, and is very often employed. It may be given with special apparatus (Junker's), and 2 p. c. vapour of chloroform to air is said to be the safe limit. This may hold good for animals, but probably a higher percentage is necessary in man. Lister estimated the percentage at 4 p. c. Now, however, that special instruction in anæsthesia is given to students, we need not enter into special details of administration.

The patient, with chest and limbs warmly clad, occupies the dorsal position on the table. The abdominal surface has been carefully prepared, and is at present covered with a moist sterilised dressing and a mackintosh fastened with a sterilised bandage. These are now removed by the nurse, and the operator may again cleanse the surface with lysol and spirit, or corrosive lotion (1-2000) and spirit. His hands and those of his assistant have been cleansed in the way already mentioned. The operation area is surrounded with sterilised towels, pinned, so that a square area for operation is exposed, or a large sterilised sheet with a vertical slit corresponding to the abdominal incision may be used; below the towels or sheet purified mackintoshes have been placed. The operator and his assistants and nurses, now that everything is ready, should once more wash their hands in antiseptic lotion. Some recommend the use of rubber gloves. These can be sterilised either by dry heat, in which case talc powder dusted inside facilitates their being slipped on, or they may be boiled, and slipped on easily when filled with sterilised lotion. With a little practice they do not interfere with one's touch, and are a great safeguard against infection. When septic cases are being operated on—abscess, pus tubes, etc.—their use is essential to avoid the contamination of the hands, which is not so easily got rid of as is usually imagined.

THE ABDOMINAL INCISION.

The average incision for an ovariotomy is four inches; for a fibroid it varies according to the size of the tumour. It is usually made in the middle line, passing through skin, fat, linea alba, extra-peritoneal fat, and peritoneum (fig. 353). If one does not hit the linea alba the rectus muscle may be cut in the same line, or one may pull on the fascia and find the linea on the side yielding least to gentle pulling.

Langenbuch's incision may be made on the outer side of the rectus for kidney operations, but it cuts the nerve supply of the abdominal wall, and thus most prefer the curved lumbar incision or a mesial one in cases of kidney tumour.

The supra-symphysial incision of Küstner is now used in many cases, where a large incision is not called for. A curved incision is made from side to side in the skin fold above the pubes, and goes through skin and fat. This is raised up as a flap, and then linea alba, extra-peritoneal fat, and peritoneum incised *in the vertical mesial line.* Such an incision is much less likely to be followed by hernia subsequently.

The peritoneal cavity having been thus opened, the operator, after arresting all hæmorrhage by pressure forceps, passes in his fingers and verifies his diagnosis, or finds that the condition is different from what he expected; according to what he finds he goes on to completion of the operation.

In the chapters on the removal of ovarian and fibroid tumours we described the operation called for in a simple case. Special difficulties arise, however, in cases where these tumours have extended underneath the peritoneum, and these call for notice here.

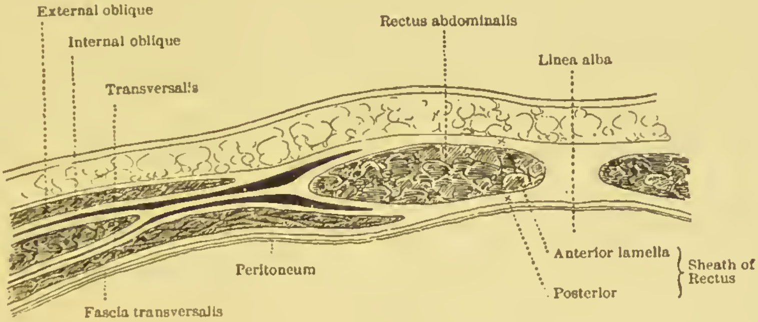

FIG. 353.

SHOWING LAYERS OF ABDOMINAL WALL which have to be divided in abdominal section.

1. *Ovarian tumours which have developed extra-peritoneally and are thus non-pedunculated.*

When the abdomen is opened it is noted that the surface of the tumour has not the dense pearly lustre of an ordinary ovarian cyst but is darker and thinner—peritoneum in fact. The hand passed in will feel that there is a reflexion where the peritoneum passes from tumour to abdominal wall, and that the hand cannot thus be passed deeply, as in the pedunculated ovarian tumour.

The peritoneum is incised to an extent nearly corresponding to the external wound, the edges laid hold of with forceps, and the finger passed in to enucleate. When this has been done so far, the tumour should be tapped. It can then be drawn out and enucleated simultaneously. There may be little difficulty in doing this or it may cause a good deal of bleeding, and thus as soon as possible the ovarian artery should be tied on the infundibulo-pelvic side, and also on the uterine side of the tumour. Forceps or ligature can be freely used on bleeding points, but great care must be taken to see that the ureter is not tied or clamped. To prevent such an accident all vessels should be carefully inspected, and if in peritoneum, held up to the light where possible, as one is apt to be misled, and the best operators have been mistaken. Care must be specially taken in the neighbourhood of the large veins, and deep ligatures should not be passed there lest a vein or the ureter be punctured. When the enucleation is completed we have to close the *extraperitoneal sac.* If the posterior fornix is accessible the vagina should be opened into, a gauze end passed through, the rest of the sac tamponned, and then the opening above closed with interrupted catgut. The abdominal wound is then closed in the usual way. Another way of treating the extraperitoneal sac is to tampon it with gauze, and bring the gauze out through the lower end of the abdominal incision. The sac opening is diminished in size, if necessary, by a running suture, and then the edges of the sac opening stitched to the abdominal incision, and the rest of the abdominal incision closed in the usual way. The gauze can be left in from four days to a week or longer, and then renewed, or an india-rubber drainage tube employed. Cases like the present may be very difficult when the tumour burrows deeply.

(2) *The development of a fibroid tumour into the broad ligament* may be lateral or bi-lateral. The latter is rare and the former not very common.

When lateral development takes place the difficulty in shelling out is to avoid injury to the ureter. This must, however, be guarded against, owing to the seriousness of such an accident. The operator must first tie the broad ligament *on the easy side*, and do the stages of supra-vaginal amputation until the cervix is cut across and the opposite uterine artery secured; the part developing in the broad ligament can now be shelled out, and the round and broad ligaments with the ovarian artery clamped and tied. When the lateral tumour in the broad ligament develops too deeply for the former plan, panhysterectomy with a modification by Pryor may be done as follows. Separation of broad ligament on both sides; opening of Douglas' pouch, separation of bladder and vagina in front, uterine artery secured on easy side, and also ovarian artery of affected side. The vagina has thus been freed behind, in front, and on easy side. The uterus is now carried over to side involved, and with a strong handled rectangular needle (Deschamps) the lateral attachment between vaginal fornix close to the cervix and base of tumour are encircled with a ligature, so as to control the uterine artery. The ureter is never there. When the attachment is cut the intraligamentous nodule shells out, and the broad ligament can be clamped and ligatured as necessary. Iodoform gauze is now packed into the vagina and the top of the space in the broad ligament.

It must be remembered that the ureter may be markedly displaced, may lie on the top of the laterally developed fibroid, and be flattened out and vein-like. When the tumour developes bi-laterally in the broad ligament the uterus may be split antero-posteriorly, and thus the ligamentous nodules shelled out.

For other complications Kelly's *Gynecology* and Pryor's *Gynecology* can be consulted by the young specialist.

For cases of uterine fibroids, where the lateral expansion of the tumour renders its removal difficult, as well as for cases where it is necessary to remove the uterus along with the tubes and ovaries for extensive tuberculous or inflammatory mischief, Kelly and Faure recommend a modification of the ordinary supra-vaginal amputation.

The abdomen is opened, the Trendelenburg posture being employed, and the fundus uteri laid hold of on each side of the middle line with volsellæ slightly curved on the flat. The uterus is then split between these down to the os internum, a fresh grip of the uterus with a volsella being taken when necessary. At this level the one half is clipped carefully across transversely, the uterine artery seized, and then the half further pulled up, the round ligament and upper part of broad ligament clamped, and thus this half removed. The clamps are removed after ligatures have been employed. The same is done with the other half, and the cut line of broad ligament and uterus united as described under supra-vaginal amputation of the uterus for fibroids.

The principle of this method is that, instead of beginning at the sides of the pelvis and working down towards the cervix in the middle line, the operator is enabled by the splitting of the uterus to begin in the middle line below and work his way outwards and upwards.

Before considering the closure of the wound reference must be made to peritoneal toilette and drainage.

Peritoneal Toilette. This term is a convenient one used by German operators to indicate the *cleansing of the peritoneum.* It cannot be too strongly emphasised that every bleeding point must be secured before the abdominal wound is closed; time spent in doing this is not wasted. Any blood clots lying among the coils of intestine or in the pouch of Douglas must be removed by means of swabs, but the importance of removing every drop of blood and serum and "leaving the peritoneum thoroughly dry" has been much exaggerated. The peritoneum is an absorbent surface, and is quite capable of getting rid of any small quantity of blood or serum *provided it be aseptic.* Further, the swabbing necessary to remove the last traces of serum does positive harm, inasmuch as it so roughens the peritoneal surfaces as to set up adhesions between the coils of intestine and pelvic organs, which may give rise to subsequent trouble. The fluid of a parovarian or simple ovarian cyst, if in small amount, is easily tolerated and quickly absorbed by the peritoneum, so that should any of it have escaped into the peritoneal cavity, time should not be wasted in attempting to remove it all completely; as much is removed as can be done quickly and without injury to the peritoneal surfaces.

This, however, should not make the operator careless in preventing the escape of fluid into the abdominal cavity.

If the cyst contents have been very gelatinous more careful cleansing is required for fear of the subsequent development of pseudomyxoma peritonei.

Drainage. In ordinary simple cases drainage is not required, and the oftener it can be dispensed with in complicated cases the better, as, besides retarding the primary healing of the wound, it greatly increases the subsequent risk of hernia. For this latter reason, we should if possible, drain through the vaginal roof, and not from the abdominal wound in those cases where drainage is imperative, *e.g.*, when the tumour has contained pus and there has been soiling of the peritoneum, or where oozing from the breaking down of extensive adhesions cannot be properly controlled. The best drain to use is probably one of sterilised iodoform gauze. This has to a large extent superseded the perforated glass and rubber tubes formerly so extensively employed. The gauze is lightly laid into the pelvis, and its end left in the lower angle of the abdominal wound or in the vagina, according as the drainage is from above or below. The time it is left in varies in different cases. When it has been employed for fear of hæmorrhage it can be safely removed in forty-eight hours and the wound allowed to close. This also applies to cases where peritoneal infection was feared, provided there is no discharge and no symptoms of peritonitis. Should there be a discharge of pus or symptoms of peritonitis the original drain must be removed and a fresh strip of gauze substituted, and the wound allowed to close up from below, fresh gauze being inserted each day; or after a few days a rubber tube may be substituted for the gauze, and the cavity syringed out daily through this.

CLOSURE OF ABDOMINAL WOUND.

The operator having satisfied himself that the operation is safely finished, *i.e.*, that no hæmorrhage is going on, that the pedicle is right, and the swab and instrument count correct, has now to close the wound. The omentum is pulled down so as to cover the intestine; a swab is passed below the incision so as to cover this and soak up any blood from the stitch punctures. The methods of suturing employed are various, viz.:—

1. Through and through with silk or silkworm gut.
2. Tier suture, all catgut; or catgut for peritoneum, with wire or silkworm gut for fascia and catgut for fat and skin.

1. *Through and through with silk or silkworm gut.* This may be termed the old method and is still employed by some. Braided silk is not now used but silkworm gut instead. It is advisable to pull out the fascia with forceps. The silkworm gut is passed threaded on a full-curved needle from the skin surface through muscle and fascia to peritoneum ; it is pulled through and on the other side passed through peritoneum, fascia, muscle, and skin : it thus penetrates all the tissues. The punctures in the skin should be about one-fifth to one-third inch from the margin, and they should be about half-an-inch apart. A pair of forceps may be placed on the ends of each suture. When all are passed the sutures are tied, not too tightly, after the swab has been withdrawn. It should be noted that the skin edges are brought together accurately, and for this purpose the operator should adjust them with dissecting forceps after they have all been tied, and if necessary, a continuous superficial horsehair suture passed. The ends are then cut short ; aseptic gauze or iodoform gauze is laid over the incision and fastened down with gauze and collodion or strapping. Sterilised wool is placed over this, and the whole secured with a broad flannel or linen bandage.

The advantages of this method are its rapidity, that no buried sutures which might go wrong are employed, and that if any stitch sets up irritation it can be removed without affecting the others. The disadvantages are that the wound may become infected from the skin punctures, and a callous induration or stitch abscess follow. The latter does not usually pass deeper than the aponeurosis. Hernia is also said to be more frequent. The sutures are removed on the eighth to tenth day, or even later, when the wound is usually found soundly healed. It is then cleansed, and gauze and strapping employed. When soundly healed, the patient has a well fitting abdominal belt applied, and should wear this for a year or two. Some recommend its permanent use, and if drainage has been used this is advisable.

2. *Tier suture, all catgut.* Many operators employ this method and get good results. A catgut not too easily absorbed must be used (*v.* p. 151).

Fix the peritoneum at the upper and lower angles of the incision and on each side at the mid-point, with forceps ; then run a continuous fine catgut suture from end to end, withdrawing the swab before tying finally. The tying is done by keeping the free end back when the needle is finally passed, and tying it firmly to the last loop. The surface should be felt with the finger to see that it is firm. The fascial edge is now grasped with forceps, and the catgut suture (medium size, mattress one) passed. In the mattress suture, after passing through both fascial surfaces transversely the suture re-enters a little further down, and returns again, and is then tied (fig. 354).

Silver wire or *silkworm gut* may be used instead, the former preferably. If wire be used, the ends are twisted five times, cut short, and laid horizontally on the fascial surface. Catgut may be used between these. The fat is now sutured with fine catgut, continuously, and finally the subcuticular suture employed to close the skin edge.

Subcuticular suture. Use fine catgut, and pass it below and paralell to the epidermis, in the tough corium. The suture is passed from side to side grasping on each side about one-eighth of an inch of tissue, and goes from one end of the wound to the other where it is tied (*v.* fig. 354). The skin edges are thus laced together, and there are no punctures communicating with the skin surface.

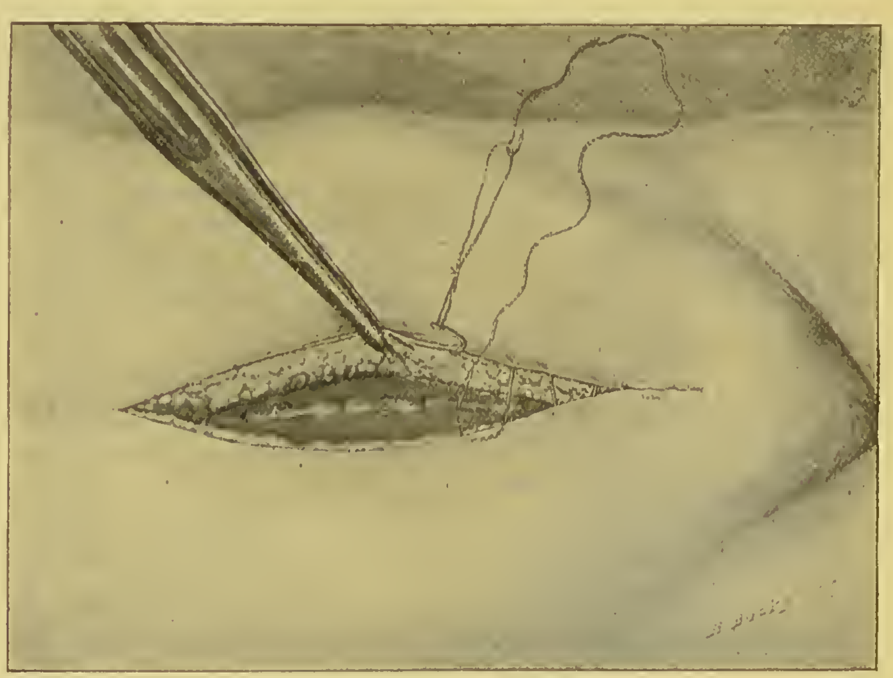

FIG. 354.

CLOSURE OF ABDOMINAL WOUND (*Kelly*).

The fascia is closed in the bottom of the wound by mattress sutures of silver wire, with catgut between. The skin is being closed by the continuous subcuticular catgut suture. The lower angle of the wound is closed, but higher up the suture has not beeD drawn tight.

The advantages of this plan are strength, freedom from skin infection, and the more æsthetic appearance of the scar. The disadvantages are that the buried sutures may give trouble, and that the catgut may not be thoroughly sterile. It takes longer to do, and this is a disadvantage in tedious cases.

The wound may be dressed with sterile gauze or sterilised silver foil may be laid over it. The final result is that the catgut sutures are absorbed, while the silver wire or silkworm gut remains permanently. Sometimes they act as foreign bodies and come away ultimately.

Other methods are, peritoneum with catgut, skin, fascia and muscle with silkworm gut or silver wire; or peritoneum and fascia with fine silk, and skin and fat with silkworm gut.

AFTER TREATMENT.

The patient is kept lying on her back in a darkened room and a nurse must be in constant attendance for the first three days.

For the first twelve hours she should have nothing by the mouth except a few sips of hot water to relieve thirst, should it be excessive. After this she is allowed warm milk, diluted with equal parts of water, about 2 drachms being given at a time and repeated every two hours. The quantity is gradually increased from 2 drachms to half-an-ounce and 1 ounce at a time, and pure milk substituted for the diluted. In some cases the thirst is allayed by saline enemata, and some operators inject one before the patient leaves the operating table, while she is still in the Trendelenburg posture. In the early morning of the third day a dose of magnesium sulphate or castor oil is given, followed in four hours by a soap and water enema. After the bowels have been thus moved the patient is allowed tea, beef tea, milk puddings, etc., and the sooner she is put on a strong nourishing diet the better.

The catheter is generally required for the first twenty-four or forty-eight hours, but the patient ought to be encouraged to pass urine naturally from the first. It is only in a very few cases that there is any difficulty after the third day.

Vomiting is sometimes very persistent and distressing for the first day after the operation. It can generally be relieved by sips of hot water or the application of a mustard leaf over the epigastrium. If these measures fail it may sometimes be speedily arrested by washing out the stomach through a stomach tube.

There is generally a good deal of pain for the first twelve or twenty-four hours. The only drug which will effectively alleviate this is morphia, and there is no objection to its use in the early hours after operation, if the patient is in great distress. It is best to give it hypodermically—$\frac{1}{4}$ grain repeated if necessary. The abdominal pain often complained of on the second and third days must be distinguished from that occurring immediately after operation. The latter is probably due to the strangulation of the pedicle by the ligature; the former is, in most instances, due to the accumulation of flatus in the small intestine. It must therefore be treated not by morphia, but by the administration of an enema. A very good enema for such cases consists of magnesium sulphate ℥i, glycerine, ℥i, water ℥ii. This is preferable to the rectal tube, which, besides being disagreeable to the patient, and sometimes difficult to pass, often fails to relieve the distension. Should the pain and distension be very great the purgative medicine and soap and water enema may be given earlier than usual. Some operators like to have the bowels well moved the day after operation.

SPECIAL COMPLICATIONS DURING OPERATION.

In cases of dense *intestinal adhesion* to any tumour or distended tube great care must be exercised so as not to tear intestine. The great principle is to leave part of the tumour wall or tube on the intestine instead of separating them, if in doing so there is the risk of a tear into the intestinal wall or lumen. Of course many adhesions can be sponged off, or clipped off, but we here speak of "dense adhesions." If the small intestine is injured but the lumen not opened, the edges should be brought together with fine silk or catgut. If the lumen be opened slightly the peritoneal surfaces should be apposed with Lembert sutures. If the injury is extensive the injured part may require to be resected; it is advisable to place an iodoform gauze strip in contact with the injured bowel, and to bring it into the vagina through the Pouch of Douglas. In the separation of adhesions to a pyosalpinx on the left side the rectum may be torn into. It should be stitched when possible as above, or resected. Sometimes the tip of the vermiform appendix is adherent to tumours or involved in inflammatory adhesions. It should in such a case be removed (*v.* Kelly's *Operative Gynecology*, Vol. II., Chap. XXXVI.). The mesentery is first tied with fine silk and cut, and then the appendix itself is ligatured with fine silk and cut through, the free end being touched with pure carbolic. Care must be taken that no escape takes place from the part cut away. The *bladder* may be cut or torn into. The former accident has happened to operators in operations for fibroids, or in separating dense adhesions. The aperture should be stitched with fine silk, not entering the mucous membrane but penetrating the peritoneal and muscular coats, and inverting the former somewhat. A drainage catheter should be kept in *per urethram* for some days.

Of great importance are *ureteric injuries.* The ureters may be accidentally ligatured, one or both, in supravaginal amputation for fibroids, when the uterine arteries are tied if the operator passes his needle too far out (fig. 227); or if bleeding start in their neighbourhood the ligatures used may tie in the ureter. If detected at the time the ligature should be untied, and the individual bleeding points ligatured. When in doubt, Kelly has exposed the ureter at the side wall of the pelvis, opened it by a longitudinal slit, and passed a probe down to the ligature. The slit is then closed with fine silk.

If both ureters are ligatured and this is not detected, uræmia will come on. Cases have been recorded where the abdomen has been re-opened for this, the ligatures untied from the distended ureters, the patient recovering. When one ureter has been tied the after diagnosis is difficult, but the diminution in the amount of urine, and the ultimate development of hydronephrosis or a fistula will make the accident plain. Sometimes, however, the kidney atrophies on the affected side.

The ureter may be cut during operation for fibroids. It has usually in these cases been displaced, and simulates a vein. The error is soon noted, and a probe may be passed down into the bladder and up to the kidney if any doubt exists.

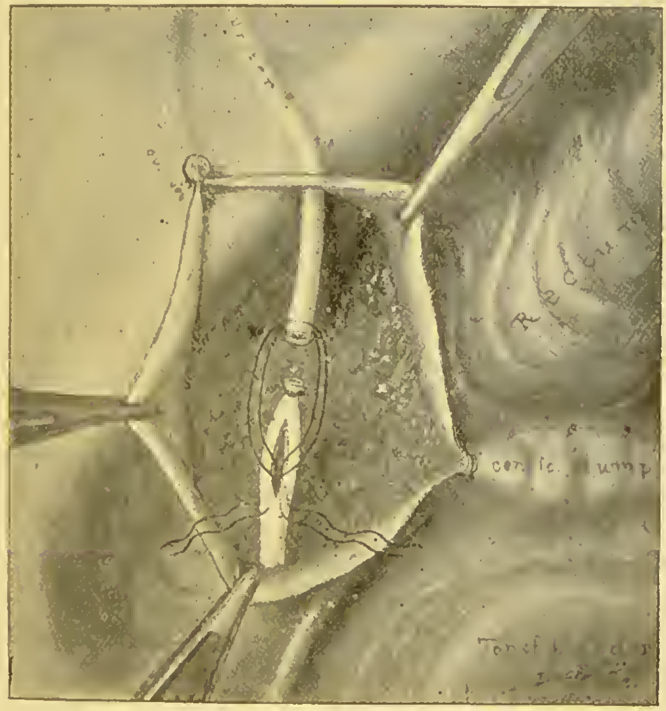

Fig. 355.

Ureteral-anastomosis, showing the ureter divided, and the lower end tied and split on one side, ready to receive the upper end, which is drawn down into it by two traction ligatures (*Kelly*).

The treatment is lateral anastomosis by von Hook's method. The lower end of the ureter is tied with fine silk, and a lateral slit made in it below the ligature. In the upper end two fine silk ligatures are passed, mattress suture, through the wall of the ureter but not into its lumen, and then through the slit in the lower end, whose wall they penetrate from within out. The upper end is then drawn through the slit and the ligatures tied (fig. 355). Further fine sutures can be used to close the slit more accurately when necessary. This presupposes sufficient length of ureter, and that no part has been cut away. In one case where there was shortage, Kelly separated the bladder, so that it could be drawn up, made an aperture in it with long slender forceps passed *per urethram.* The upper end of the ureter was then drawn into the bladder, and fixed by silk sutures. If time does not permit of these operations, the upper ureteric end may be fixed into the abdominal incision, a ureteric catheter conveying the urine from the wound, and a subsequent plastic operation performed (*v.* Kelly's *Gynecology* Vol. I.). The ureter may be lacerated in the enucleation of extra-peritoneal tumours, or when separating adhesions in the neighbourhood of the sacro-iliac joints or side wall of the pelvis.

The proximity of the *large veins* must be kept in mind. Cases have been recorded where these have been torn with immediate serious results, and ligature may prove ultimately dangerous to life.

COMPLICATIONS FOLLOWING OPERATION.

These may be:

1. Secondary Hæmorrhage.
2. Septic Peritonitis.
3. Ileus.
4. Yielding of Wound.
5. Stitch Abscess.

1. *Secondary* or *Reactionary Hæmorrhage.* The symptoms of this are quickening of the pulse, pallor and sighing, sickness, restlessness, cold clammy skin and air hunger. The patient may soon become unconscious, the pulse may go and death ensue unless prompt treatment is adopted. As the hæmorrhage usually occurs soon, the instruments used at the operation are available. It should be made a rule that in private the instruments are left for the first day lest this complication should arise.

Treatment. After rapid preparation of his hands and careful anæsthesia, the operator cuts the abdominal stitches, and at once passes in his fingers to the pelvis, towards the pedicle. This is at once drawn up, and if the ligature is found slack another is applied. Clots are cleaned away, the cavity irrigated with warm salt solution and a venous or sub-mammary saline infusion given. Strychnia hypodermically ($\frac{1}{60}$th grain) and brandy should be administered. The abdominal wound can now be closed as rapidly as possible with through and through silkworm sutures. The patient is then put back to bed—in bad cases it may be desirable to perform the operation in bed — hot water bottles packed round her, and rectal enemata of brandy and beef-tea given. When the ligature slips, it is generally at the infundibulo-pelvic side of the pedicle.

2. *Septic Peritonitis.* This is the most serious accident, and difficult of successful treatment. It may come on in a few hours after operation, and usually at any rate within three to five days. The symptoms are increase in the pulse, which may rise to 120–140, or become running or imperceptible; an increase of temperature not in proportion, 99°–101° F.; abdominal distension and distressing vomiting. Septic rashes may be present.

In making up his mind as to the diagnosis, the operator has to weigh the nature of the operation. If severe, with much oozing, presence of pus or injury to intestine the fear will be that sepsis has occurred: on the other hand, the fact of its having been a simple operation does not negative sepsis. A vaginal examination should be made to ascertain any focus or bulging.

Treatment. Calomel in $\frac{1}{4}$ to $\frac{1}{2}$ grain doses every half hour till three grains are taken, should be tried to eliminate mere bowel paralysis. If no improvement ensues the lower stitches may be removed with all antiseptic precautions, and the finger passed in to ascertain pelvic conditions. If serum or pus be obtained this should be evacuated and iodoform gauze packed in. In some cases it may be necessary to open out the whole abdominal wound so as to wash out the peritoneal cavity thoroughly (*see* also chapter on pelvic peritonitis). Saline venous or subcutaneous infusion should be given, and repeated on subsequent days.

In *Septicæmia* there is a general infection present (lymphatic) while in *Pyæmia* we have metastases by blood vessels. The latter is a slower process than septic peritonitis, and is usually accompanied by chills and perspirations, with marked remissions of temperature.

3. *Ileus.* In this there is paralysis of a section of the small intestine due to post-operative adhesions so that a knuckle becomes strangulated. The pulse is slower than in sepsis, and leucocytosis is not present as it is in sepsis. Severe colicky pains are present; no motions or flatus are passed, distension is marked, and vomiting ultimately fæcal, comes on. Rectal nutrient enemata and no stomach feeding; administration of strychnia, and finally re-opening of the abdomen and freeing of the bowel form the treatment.

4. *Yielding of Wound.* This very serious accident may occur as the result of severe vomiting; too early absorption of catgut sutures; or sudden strain by the patient. It has occurred with silk sutures and may happen in the case of old women. Bulging of dressing and moisture attract attention. The patient is anæsthetised. The protruding viscera, usually the small intestines must be carefully cleansed with warm saline solution (after the abdominal skin has been purified) replaced, and the wound sutured with through and through stitches of silkworm gut or in layers.

5. *Stitch Abscess.* Usually there is some little elevation of temperature and local pain. The few drops of pus do not, as a rule, go deeper than the fascia. Removal of the stitch and mild antiseptic dressings are sufficient. If the pus burrows laterally the edges of the skin should be separated so far as necessary, the parts cleansed, iodoform gauze packed in, and strapping applied. The peritoneal cavity may become infected in stitch abscess.

ANTERIOR AND POSTERIOR COLPOTOMY: VAGINAL HYSTERECTOMY.

Anterior Colpotomy. Vaginal fixation has demonstrated that the abdominal cavity can be reached by an incision from the vagina through the loose tissue separating the bladder and cervix uteri, and opening the vesical pouch of peritoneum. We are indebted to Dührssen of Berlin for this operation—"anterior colpotomy" or "vaginal cœliotomy." Martin of Greifswald has, among others, also strongly recommended its employment in suitable cases. Dührssen's operation has been described at p. 389.

Martin's method of operating is briefly as follows. The patient is placed in the lithotomy posture and the parts cleansed as usual. A modified Sims' speculum with a short broad blade is then introduced into the vagina, and the anterior lip of the cervix uteri seized with a volsella and drawn down. A convenient form of instrument is Orthmann's forceps, which combines a uterine sound and volsella, and thus defines the uterus during the operation. The anterior vaginal wall is also laid hold of in the middle line with an additional pair of forceps at a point about 3 inches from the external os.

A vertical mesial incision is now made until the loose tissue between bladder and vaginal wall and cervix is reached. This is separated laterally, and the bladder is then pushed up with the finger until the vesico-uterine fold of peritoneum is reached; this is then incised, and the peritoneal cavity thus opened.

The body of the uterus can now be brought into the vagina either by traction sutures, or by taking hold of the uterus from below up with bullet forceps and exercising traction, and with it the appendages, so that the necessary operations can be performed.

The indications are (1) inflammatory conditions of tubes and ovaries, small cystic ovaries; (2) pyosalpinx and hydrosalpinx, tubal gestation; (3) small fibroids, which can be enucleated either entire or by morcellement by an incision through the anterior wall. The tumour should not be larger than two fists. Schauta, Abel, and others operate by this route, even for large cystic tumours.

After the necessary operation has been performed, the uterus should be replaced through the opening, and the incision closed with catgut as follows. Pass an interrupted catgut suture (No. 4, Hartmann) through the upper vaginal edge, the loose tissue at base of bladder, peritoneum, and then back through corresponding edge on opposite side: tie. Similar transverse sutures are passed at a lower level. The continuous sutures may be used in a similar way, either alone or combined with the interrupted.

The results of this operation are excellent, the mortality is small, and the disturbance to the patient less than in abdominal section. In 390 cases Martin had four deaths.

Posterior Colpotomy. Here the operator opens into the pouch of Douglas.

From the fact that this is a common situation for inflammatory deposits, extra-uterine gestation, prolapsed uterine appendages and small tumours, these can be got access to more directly than by anterior colpotomy.

A transverse incision is made in the posterior vaginal fornix, and then by dissection, the finger being passed into the wound occasionally to recognise structures, the pouch of Douglas, or the cavity to be evacuated, is reached. In some cases, *e.g.*, prolapsed appendages or small tumours, the diseased part is removed; in others, as in inflammatory collections or extra-uterine gestation too adherent for removal, the operator has to be content with opening into the cavity and stuffing it with gauze.

In *Vaginal Hysterectomy* by forci-pressure or ligature we have a means of access due to Péan, and greatly developed by Richelot, Doyen, Ségond, the brothers Landau, Jacob, and many others. The procedure has already been sufficiently described (*v.* p. 504). By this method we can remove the uterus affected by cancer or fibroids, and often actually diseased in inflammatory conditions of the appendages, and at the same time gain access to the peritoneal cavity for the treatment of appendage mischief. The operation is thus more thorough, if more severe than colpotomy.

To sum up, we have in abdominal section the most universally applicable method of operation for intraperitoneal conditions, and one by which all forms of intraperitoneal disease can be treated. In large tumours it is practically imperative. Colpotomy has evident advantages in the case of small tumours, ovarian and uterine, and in inflammatory appendage disease; while vaginal hysterectomy has its own rôle in cases of cellulitic fixation of uterus, with or without suppuration, intractable chronic endometritic conditions, and those where we have combined uterine and appendage mischief.

ELECTRICITY IN GYNECOLOGY: THE APOSTOLI METHOD OF TREATMENT.

History of the Apostoli Method.

History.—Apostoli tells us that he studied the surgical employment of electricity at the *Clinique* of Dr A. Tripier, whose memoir to the Academy of Science in Paris, on Faradisation in the Treatment of Hypertrophies of the Uterus,[1] opened up the way. Apostoli saw the weak points of Tripier's practice; among others, that the currents employed were too feeble, their intensity not regulated and measured, the point of application wrongly chosen, and the different effects of the Faradic and the Galvanic (or Voltaic) currents, as well as of the positive and the negative poles not distinguished. He began to work out his own ideas in 1882; and in 1883, he described his electric treatment of Perimetritis, reading a paper on that subject at the Congress of Copenhagen in 1884.[2] In this same year (1884) he laid a memoir on the subject of treatment of Fibroid Tumours of the Uterus by Electricity before the Academy of Medicine of Paris; the subject, as already mentioned (p. 440), of his paper read at the Dublin meeting of the British Medical Association in 1887. It was also in 1887 that he published a book on the *Electric Treatment of Chronic Metritis and Endometritis.*[3]

Apostoli's subsequent papers and the more recent literature have been already given in describing the electrical treatment of Fibroid Tumours.[4] The best English article on Electricity in relation to the Diseases of Women is R. Milne Murray's monograph in Clifford Allbutt and Playfair's System of Gynecology, which contains a bibliography.

Note on Electrical Terms Used.—In order to make clear the description of Apostoli's method which follows, it will be well first to explain some of the terms used, so that students may read straight on without the interruption of consulting books on electricity which may not be at hand at the time.

Kinds of Electric Current.

In the first place, there are two distinct kinds of electric current spoken of, the *Galvanic* (perhaps more accurately the "Voltaic") and the *Faradic.* The former is the electricity that flows in continuous current through the wires from the zinc and copper plates in a voltaic or galvanic cell or battery when their ends are connected. As sulphuric or other oxidising acid is added to the water in the cell, this kind of current is *chemical* in its origin. When the current flows, the zinc plate is used up, its consumption furnishing the energy to drive the current through the cell and connecting wire: the cell, in fact, has been aptly compared to a sort of chemical furnace in which the fuel is zinc. The faradic current, on the other hand, is an *induction* one, *i.e.*, is a current induced in a closed circuit when a magnet is moved near it or when it is moved across the magnetic field, or when an electric current whose strength is changing is near it. The source of this current is, accordingly, not chemical but electro-magnetic.

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[1] Hyperplasies conjonctives des organes contractiles de l'emploi de la faradisation dans la traitement des engorgements et déviations de l'utérus et de l'hypertrophie prostatique: Comptes Rendus de l'Académie des Sciences, Août 1859. Leçons de clinique sur les maladies des femmes: Paris, Octave Doin, 1883.

[2] Sur un nouveau traitement des périmétrites: Comptes Rendus du Congrés de Copenhague, Section d'Obstétrique et de Gynécologie, p. 141.

[3] Sur un nouveau traitement de la métrite chronique, et en particulier de l'Endométrite, par le Galvano-caustique chimique intra-utérine: Paris, Octave Doin, 1887.

[4] *See* p. 440.

Electro-motive Force and Strength of Current.

That which tends to produce a current, *i.e.*, to move electricity from one place to another, is called *Electro-motive* force; the *Strength of a Current* is the quantity of electricity which flows past any point of the circuit in one second, and is directly proportional to the electro-motive force, and inversely proportional to the resistance which the current has to overcome in its flow. This truth with regard to the strength of an electric current flowing in a circuit is, from the name of its discoverer, known as *Ohm's Law*, which may be formally stated here—"*The strength of the current varies directly as the electro-motive force, and inversely as the resistance of the circuit.*" The terms "strong," "great," and "intense," applied to currents all mean the same thing.

Measurement of Strength of Electric Currents.

To measure the strength of electric currents there is used an instrument called the *Galvanometer*, in which a magnetised needle is deflected by a current passing above and below it through a coil of silk-covered insulated copper wire—the amount of deflection depends upon the strength of the current (though not proportional to it) and a properly graduated dial enables us to ascertain perfectly the strength of the current. The sensitiveness of the instrument is greatly increased by the use of the *astatic* needle, a compound one in which the directive power of the earth is neutralised by the joining of two magnetised needles of equal power connected one above the other by a central pin so that the north pole of the one lies over the south pole of the other, and the south pole over the north pole of the other. The sensitiveness is also increased within certain limits by increasing the number of turns of the coil of silk-covered wire. A galvanometer must to able to measure the quantity of electricity passed, and should be of a degree of sensitiveness corresponding to the strength of the current to be measured—very sensitive for very small currents, less sensitive for strong currents.

UNITS OF MEASUREMENT.—Every kind of measurement requires a unit: as in measuring length we might take the inch, foot, yard, or mile; and in measuring mass or weight we use the grain, ounce, pound, hundred-weight, or ton. Accordingly, for measuring electricity, we have in the first place a series of what are called *absolute* electric units derived from the fundamental Centimetre Gramme-Second system (C.G.S.) in which—

The *Centimetre* (·3937 in.) is the unit of length,
The *Gramme* (15·432 grns.) is the unit of mass, and
The *Second* is the unit of time.

There are three *derived* units which it is necessary to bear in mind in order to understand the electric units which follow. These are—

The *Dyne* or unit of force, that force which acting for one second on a mass of one gramme gives to it a velocity of one centimetre per second;

The *Erg* or unit of work, the work done in overcoming unit force through unit distance, *i.e.*, in moving a mass through a distance of one centimetre against the force of a dyne; and

Unit Strength of Magnetic Pole.—The unit magnetic pole is of such a strength that when placed at a distance of 1 cm. in air from a similar pole of equal strength it repels it with a force of one dyne.

We are now in a position to understand the definition of the units referred to in the explanation of Apostoli's method. As that method deals with Current Electricity in which the positive and negative poles are in properties the same as magnetic ones, these units are called Electro-magnetic.

Electro-magnetic Absolute Units.—(1) *Unit Strength of Current* is that of a current such that if one centimetre length of its circuit be bent into an arc of one centimetre radius it will exert a force of one dyne on a unit magnetic pole placed at the centre of the circle of which the arc is a part, so as to be always a centimetre away from the current.

(2) *Unit Quantity of Electricity*, that quantity of electricity which is conveyed by current of unit strength in one second.

(3) *Unit of Difference of Potential or of Electro-motive Force*, exists between two points when it requires the expenditure of one unit of work (Erg) to bring a unit of + electricity from one point to the other against the electric force.

(4) *Unit of Resistance* is possessed by a conductor when unit difference of potential between its ends causes a current of one unit of quantity per second to flow through it.

The first two of these absolute units were found to be inconveniently small and the last two inconveniently large, accordingly a committee of the British Association devised a system of "practical" units in which they substitute for the fundamental units *centimetre* and *gramme*, the Earth's quadrant (1,000,000,000 centimetres) and $\frac{1}{100.000.000.000}$ of a gramme.

Electro-magnetic Practical Units.—(1) The *Volt*[1] is the practical unit of *Electro-motive force* and is 100,000,000 absolute units.

(2) The *Ohm*[1] is the practical unit of *Resistance*, and is 1,000,000,000 absolute units.

(3) The *Ampère*,[1] the practical unit of *Strength of Current*, is that furnished by a Volt through an Ohm and is $\frac{1}{10}$ of the absolute unit. In medical electricity, however, the strength of the current is measured in milliampères.

(4) The *Coulomb*[1] is the practical unit of *Quantity* of current electricity, and is $\frac{1}{10}$ of the absolute unit.

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[1] These four terms commemorate the names of four famous electricians: *Alessandro Volta*, who shares with Galvani the discovery of current electricity; *G. S. Ohm*, whose law regulating the strength of current electricity has been given above; *André Ampère*, the founder of the science of electro-dynamics; and *Charles A. de Coulomb*, the inventor of the torsion balance and demonstrator of the law that electrical attraction and repulsion vary inversely as the square of the distance.

With the aid of these units, we can now state Ohm's law in more definite language, using "*ampères*" to measure "strength of current," "*volts*" for "electro-motive force," and "*ohms*" for "resistance of circuit." Thus the two forms would run as follows:—

(General Form.) The *strength* of the current varies directly as the *electro-motive force* and inversely as the *resistance* of the circuit;

(Definite Form.) The number of *ampères* of current is equal to the number of *volts* of electro-motive force, divided by the number of *ohms* of resistance in the circuit, or more briefly;

The number of *ampères* is equal to the number of *volts* divided by the number of *ohms*.

More than one method has been tried of fixing a standard for these units. Thus, the British Association (B.A.) in 1863 constructed coils of German Silver to give the resistance of an ohm, but there was some doubt whether the B.A. unit exactly represented the practical unit of resistance as defined above. Accordingly, it was decided at the International Congress of Electricians in Paris in 1881 that the ohm could be most accurately measured by the resistance offered to the electric current by a column of pure mercury with a cross-section of one millimetre; and, in 1884, it was decided at the Paris Congress that the length of the column should be 106 centimetres. This gives almost exactly[1] the theoretical ohm, and is a little larger than the B.A. unit.[2]

In concluding this note on the electric terms used, we may mention that the ends of the wires leading from the battery are called *Electrodes;* that *Electrolysis* (*i.e.* Electric Analysis) is, strictly speaking, the process of decomposing a liquid by means of an electric current, but is also applied to the disintegrating process said to be set up in tumours or other tissues when a current has been passed through them; and that Apostoli describes his method as *mono-polar* when only one pole is active, *i.e.*, is applied to uterus, vagina, or tissue to be acted upon, and as *bi-polar* when both poles are so applied.

Apostoli in describing his application of the faradic current uses the old phraseology (employed before the discovery of Ohm's law) when he speaks of "currents of quantity" and "currents of tension" or "intensity currents;" meaning by the former a current flowing through a circuit in which there is a small resistance inside the battery,[3] or in the wire, and by the latter a current which has to overcome greater resistance, and which requires, therefore, a high electro-motive force.[4]

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[1] Lord Rayleigh calculated that the length of column to give the exact ohm should be 106·21 cm.

[2] The B.A. ohm is ·9887 of the new *legal* ohm, and the B.A. volt is ·9887 of the *legal* volt.

[3] The *internal resistance* is diminished by having larger plates or bringing them closer together; the former is usually done by connecting the zincs of several cells, producing practically one large zinc, and the same for the coppers.

[4] Brit. Med. Jour., 1888, i., p. 64. "No Apparatus for Faradisation;" he writes, "is complete without two independent bobbins; which according to the length and thickness of the wires gives currents differing in qualities and characters. The bobbin with short thick wire gives current of quantity, because the wire is less resistant and lets pass a greater volume of electricity. The bobbin with longer and finer wire is called the bobbin of tension; the current along it is called the current of tension."

These terms are scientifically misleading as the great resistance tends to counteract the high electro-motive power, and the principal phenomena of electro-magnetism are due not to the mere presence of electricity, however great in its tension, but to its state of current or flow. The terms are, however, convenient; and, what is more to the purpose here, Apostoli's whole method is founded upon his declared discovery that the physiological effects of currents in the two conditions are very different.

ACTION OF DIFFERENT CURRENTS AND POLES.

Action of the Galvanic or Continuous Current.

The mode of action of a continuous current is different at the two poles. It is thus lucidly described by Milne Murray. "This will be best understood if we study, in the first place, the effect of the passage of the current through a piece of dead tissue—say a piece of beef. A small block of fresh beef is placed on a dish, and into it two steel sewing needles are inserted at a distance of an inch from each other. One of these is connected to the positive and the other to a negative pole of a battery, and a current of, say, 50 m.a. is transmitted. The following things will be observed. 1st. In a few seconds a frothy effervescence will appear round the negative needle, while the tissue will shrink and condense round the positive needle. 2nd. If, at the end of a few minutes, the negative needle be gently pulled, it will come away without difficulty, leaving an aperture a good deal wider than its own thickness; this aperture opens into a sinus which is filled with a soft frothy scum. 3. If the positive needle be similarly pulled, it will not come away without considerable traction, and will leave a small orifice with a dense firm outline. 4th. On examination, the negative needle will be found quite bright while the positive needle will be dulled and slightly corroded. 5th. If the piece of meat be now carefully cut open, so as to expose the channels formed by the needles, it will be found that the tract of the negative needle is surrounded by a softened loose area of disorganised tissue, while the tract of the positive is surrounded by a condensed area much smaller than that round the negative needle; it is, moreover, paler in colour, and cuts with a somewhat gritty sensation. 6th. If the surfaces so exposed are tested with litmus paper, it will be found that on the negative side an alkaline and on the positive side an acid reaction is given."

In addition to the action at the poles, Apostoli and others have affirmed that there is an interpolar action through the entire uterine substance. Of this there is no evidence. Thus Milne Murray says, "Any so-called experimental proof which has been advanced in favour of the existence of interpolar decomposition can be readily explained on other grounds; and we may take it that there is no proof of any electrolytic action occurring anywhere except round the metallic electrodes."

Action of the Faradic or Induced Current.

This current has, according to Apostoli, "contractile power," but its effects differ as the "current of quantity" or the "current of tension" is used. The former, the direct excitant of *muscular contractility*, is employed to overcome uterine muscular inertia, and produce a temporary vascular activity; it thereby excites circulation where there is congestion and stagnation with consequent arrest of the nutrition of the uterus. The "*current of tension*" acts more on the *sensibility* than on the muscular contractility; it has therefore been used in all cases where *pain* is the leading symptom. This treatment Apostoli strongly recommends for perimetritic and ovarian pain, and intense sensibility about the lower part of the vagina.

THE APPARATUS AND INSTRUMENTS.

Apparatus and Instruments.

For a detailed description of these, the student should consult Milne Murray's monograph or Apostoli's papers. Here we can only mention them. They are (1) a battery capable of yielding an adequate constant current from 10 to 300 milliampères; a current regulator;[1] a galvanometer; and electrodes. The internal electrode is passed into the vagina or uterus. The *intra-uterine electrode* is of the shape of the uterine sound, the last 2 or 3 inches being made of platinum, and has a celluloid or gum-elastic sheath which moves up and down so as to have more or less of the platinum point exposed. When a sound cannot be passed into the uterus, the tumour may be punctured with a needle such as is used in the treatment of aneurisms. The *cutaneous* electrode used by Apostoli was made of wet potter's earth, spread on a layer about 8 inches square, and ½ inch thick on muslin. Equally serviceable is a fold of flannel or lint of the same size, soaked in a warm salt solution, on which a lead plate (connected with the wire) is laid. Milne Murray recommended one made of a sheet of brass wire cloth spread with a gelatine composition.

The induced or faradic current is not used as much as the continuous one. For it a faradic battery is required.

THE CURRENT: ITS STRENGTH, AND FREQUENCY OF APPLICATION

The patient being recumbent, a vaginal douche is given, and the intra-uterine electrode passed like the sound. The abdomen is sponged with salt water, and the cutaneous electrode applied, care being taken that the contact is uniform throughout. The strength of current used is determined by what the patient can bear, or the amount passing as shown by the galvanometer. The duration of application is five to ten minutes.

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[1] Milne Murray recommends the carbon rheostat.

Applications can be made twice a week, except during the menstrual period. When the period is prolonged, they can be resumed after the first three or four days of profuse bleeding are passed. The course of treatment varies. In fibroids the average number of application required is from 15 to 20 (Apostoli). Though the range attainable is up to 300 milliampères, it is not necessary to go beyond from 100 to 150.

Electro-puncture is called for when a sound cannot be passed. The needle is sheathed to within ½ inch of the point, and plunged for ¾ inch into the most prominent part of the tumour. The sheathed part comes for ¼ inch, into relation with the vaginal mucosa, which is thus protected from cauterisation by the current.

PATHOLOGICAL CONDITIONS IN WHICH ELECTRICITY IS USED IN GYNECOLOGY.

Conditions for which Electricity is used in Gynecology.

So far as our present knowledge goes, the suitable cases for Apostoli's method are—

1. *Bleeding Fibroids.*—In these the internal pole is positive, and a current strength of 50 to 150 m.a. may be used.

2. *Impacted or large Fibroids causing pressure symptoms.*—Puncture here with negative needle.

3. *Dysmenorrhœa of pathological anteflexion; membranous dysmenorrhœa.*—Internal electrode negative, and current strength about 50 m.a.

4. *Cellulitis.*—Internal electrode covered with cotton wool and placed vaginally.

5. *Endometritis* and *Subinvolution.*

The results of electrical treatment have been such that it has now a recognised place in gynecology. They have been referred to already when discussing the different pathological conditions mentioned (*see* especially Fibroid Tumours, p. 440). Perhaps the most striking results are seen in the absorption of inflammatory deposits. In addition to the local changes, the improvement in the well-being of the patient is noteworthy.

THE SYSTEMATIC TREATMENT OF NERVE PROSTRATION.

LITERATURE.

Bramwell, Byrom—The Diseases of the Spinal Cord; Edin., 1882. *Gaskell*—Preliminary Notice of Investigation on the Action of the Vasomotor Nerves of Striated Muscle: Proc. Roy. Soc., Lond., 1876-77, p. 430. *Goodell*—Lessons in Gynecology, Lesson xxx.: Philadelphia, 1880. *Mitchell, Weir*—Fat and Blood, and how to make them: Lond., 1878. *Playfair, W. S.*—The Systematic Treatment of Nerve Prostration and Hysteria: Lond., 1883.

The gynecologist will not have long practised his speciality before he finds that he has occasionally to deal with a class of patients who are quite *sui generis.* The condition of such puzzles him at first extremely, inasmuch as he can find no tangible disease, but yet is bound to confess that the general condition of health is highly unsatisfactory. Very often these patients have gone the round of all medical and surgical specialists and have come at last to the gynecologist in the hope that his art may do something to remedy their lamentable state.

The class of patients has the following characteristics. They are thin, often emaciated, unable for any exertion, suffer from neuralgia, have little or no appetite, and are nursed by some devoted sister or mother or husband. As we have said, there is no local condition to account for their state; but often there is a history of overwork, as in the case of governesses and teachers, or of an improper training. By this latter we mean that a sensitive child of high nervous organisation has been over-cultivated, her mental energies kept too constantly on the rack, and has ultimately collapsed under the strain. For this class of patients Weir Mitchell of Philadelphia introduced a plan of treatment in his well known book, the results of his method being in suitable cases highly satisfactory.

The main factors in Weir Mitchell's plan are—

I. Seclusion of the patient, and absolute exclusion of all but the medical attendant and nurse;
II. Absolute rest in bed;
III. A systematic extra-feeding of the patient;
IV. Use of massage and electricity.

I. *Seclusion of the patient, and absolute exclusion of all but the medical attendant and nurse.*

This is imperative, and the treatment should not be gone on with unless this condition is agreed to absolutely. Very often the friends have devoted themselves to every whim and fancy of the patient so assiduously as to impair their own health without improving that of their tyrannous charge.

The nurse should be thoroughly trained and refined, and should implicitly obey all the medical attendant's orders.

II. *Absolute rest in bed.*

This means muscular and mental rest, and reduces the force and frequency of the heart's action. The nutrition taken is above the amount worked off, and benefit in this way results. This absolute rest is after a while modified, and the patient allowed to sit up for a little until she may at length go about as usual, with the exception of taking a two-hours' sleep during the day.

III. *A systematic extra-feeding of the patient.*

This is one of the essential features of the method. Weir Mitchell begins with milk diet, about three ounces every two hours, until two quarts are given during the day. At the end of the first week raw beef soup[1] is given, and gradually the diet is increased until the dietary for one day, in one of Mitchell's cases was as follows. Coffee at 7; at 8 iron and malt. Breakfast — a chop, bread and butter, of milk a tumbler and a half; at 11, soup; at 2, iron and malt. Dinner (closing with milk, one or two tumblers) consisted of anything she liked, and with it she took about six ounces of Burgundy or Dry Champagne. At 4, soup. At 7, malt, iron, bread and butter, and usually some fruit, and commonly two glasses of milk. At 9, soup; and at 10, her aloes pill. At noon, massage occupied an hour. At 4.30 p.m., electricity was used for an hour.

In addition to this diet, iron in the form of Blaud's pills (p. 609) and maltine may be added to aid the digestion of starchy food. The maltine should be given in cold milk or after dinner. The evident question now arises, How does the patient digest all this? The digestion of this immense mass of food is rendered possible by the last feature of the treatment.

IV. *The use of Massage and Electricity.*

This is most important, and consists in the systematic rubbing of the patient and the application of faradic electricity.

The massage is begun a few days after the milk diet, and consists in the systematic kneading of the skin and muscle of the whole body first for half-an-hour, and afterwards for an hour daily. A special massage nurse is necessary for this, and it should be kept up for six or seven weeks. Cocoa-nut oil should be used to render the manipulations easy, and it will also help in fattening the patient.

Electricity is employed for half-an-hour daily in order to cause muscular action, increase the blood supply to the muscle, and act as a tonic and bracing agent. Mitchell has found that after the electricity the temperature usually rises about $\frac{4}{5}$ths of a degree. The current should not be painful, and Ziemssen's diagrams of the points of stimulation should be followed as a guide.

For further details, the literature given should be consulted by the practitioner wishing to carry it out.

The results in some cases are wonderful, and as yet no harm has been shown to arise to the kidneys from the over-feeding. The bowels must of course be regulated, and a daily motion secured. Before beginning this treatment in any case, it should be thoroughly ascertained that there is no organic disease, and no obscure and rare form of disease such as Addison's disease, myxœdema, etc. A consultation with a specialist should always be had in cases of doubt.

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[1] Chop 1 lb. of raw beef, and place in a bottle with 1 pint of water with 5 mm. strong hydrochloric acid. Place in ice all night, and in the morning set in a pan of water at 110° Fahr. for 2 hours. Strain thoroughly, and give filtrate in portions daily.

The patient for whom it is suitable is one where there has been underfeeding or improper food, undue mental strain, and consequent loss of flesh and nervous energy.

HYSTERIA.

LITERATURE.—*Bourneville et Regnard.*—Iconographie photographique de la Saltpétrière : Paris, 1877. *Bourneville et d'Olier.* Recherches sur l'Epilepsie, l'Hystérie et l'Idiotie : Progrès Médical, 1881. *Charcot*—Diseases of the Nervous System : Sydenham Society's Series, London, 1877. *Fritsch*—Krankheiten der Frauen : Braunschweig, 1881. *Jolly*—Article "Hysteria" in Ziemssen's Cyclopædia of Medicine. *Mills*—Hystero-epilepsy : American Journal of the Medical Sciences, Oct. 1881. *Richer*—Études cliniques sur l'Hystéro-Epilepsie : Paris, 1881.

The frequency of hysteria as a complication of pelvic disease requires that we notice it briefly. We can only indicate the leading points and refer the student to the literature given above. The connection which exists between hystero-epilepsy and the ovary also calls for short reference.

As to the pathological changes present in hysteria, little definite is known, except what Freund has described in Parametritis chronica atrophicans (*v.* p. 187). In regard to etiology, we note first the influence of heredity; defective moral education by a hysterical mother, and the power of imitation in developing hysteria, confirm this influence. A reduced state of the system is also a very important cause, and the one to which treatment must be specially directed. As to the exciting causes usually given (such as dysmenorrhœa, uterine displacements, ovaritis), these are so common that we cannot regard them as a cause of hysteria. The only ascertained facts are that removal of the ovaries has in some cases cured hysteria, and that pressure in an ovarian region does sometimes inhibit a hystero-epileptic attack.

The symptoms of hysteria are protean. *Sensation* is affected as follows. There may be increased sensitiveness to touch (hyperæsthesia) and to pain (hyperalgesia). Hyperæsthesia of the joints is important as simulating arthritis, from which it is diagnosed by the fact that the pain is around (not in) the joint, and that it is not aggravated on forcing the articular surfaces together. Neuralgia along the spine with tender points simulates disease of the vertebral column. The typical headache (known as the "clavus hystericus" from the localised and intense character of the pain), neuralgia of the muscles generally, localised pain in the breast, in one ovarian region, in the bladder and urethra, and the perversions of the special senses need only be mentioned here. When sensitiveness is impaired, it is usually that to pain; while that to heat and touch remains; one half of the body may be affected, or isolated portions of the skin — as the back of the hands and feet. Loss of the muscular sense prevents the patient, if the eyes be closed, from knowing what movements she has made. Anæsthesia of any of the mucous membranes may occur. The special senses are often also impaired.

The *motor* disturbances resulting in convulsions belong rather to hystero-epilepsy, and are fully described, with characteristic photographs, in Bourneville and Regnard's monograph. The paralysis due to hysteria is very important in regard to its diagnosis from that due to a cerebral or spinal lesion. It varies in distribution, and may affect one limb only, or the arm and leg of one side, or the arm on one side and the leg on the other. In the face, the levator palpabræ superioris is frequently affected; paralysis of the muscles supplied by the facial and hypoglossal nerves is rare. This last fact is of value in diagnosing between hysteria and hemiplegia; further, gradual onset, presence of anæsthesia and its varying distribution, normal reaction to the electric current, the progress of the case with variations in the degree and extent of the paralysis, warrant us in diagnosing hysteria. The diagnosis of hysterical paraplegia, from multiple sclerosis is more difficult. Paralysis may also affect the laryngeal muscles, producing aphonia, and the muscular wall of the œsophagus, stomach, and intestines.

Of the disturbances of the circulatory system, the most important is palpitation with increased force of the apex beat; in some cases, the heart's action fails and there is syncope. Vaso-motor disturbances are seen in the pale skin which does not bleed when pricked, and in the flushings and profuse sweatings which are often present. Salivation and polyuria often occur after a hysterical attack.

In forming a diagnosis, we must be careful to exclude the possibility of organic, cerebral, or spinal disease. A case reported by Bruce[1] is of interest in this connection; here the patient had symptoms of hysteria, there was no optic neuritis or other indication of cerebral mischief, and yet the post-mortem showed a large tumour in the temporo-sphenoidal lobe.

In treatment, the following points are of importance. Care must be taken in the mental and moral training of the children, where there is a tendency to hysteria.[2] If the system is below par, Weir Mitchell's method should be tried, and iron given when there is anæmia; cold baths are always beneficial. In grave cases, salpingo-oophorectomy may be suggested but never urged, as the results are not brilliant.

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[1] Brain, Part xxii.: 1883.

[2] Clouston: Puberty and Andolescence medico-psychologically considered: Edin., 1880.

MASSAGE.

LITERATURE. *Profanter*—(1) Die Massage in der Gynäkologie; (2) Die manuelle Behandlung des Prolapsus Uteri: Wien, 1888. *Reibmayr*—Die Massage: Leipzig, 1889. *Resch*—Ueber die Anwendung der Massage bei Krankheiten der weiblichen Sexualorgane: Cent. für Gynäk., No. 32, 1887.

One of the most common cases in Gynecology is that where, as the result of a previous attack of pelvic inflammation, the uterus and ovaries are bound down and fixed by more or less dense adhesions—usually peritonitic. For these cases many forms of treatment, ranging from the hot douche up to abdominal section, are recommended, and will be found described in various parts of this Manual. At present we wish briefly to refer to a method of treatment recently come into vogue—Massage.

By this we mean here Bimanual Massage of the adherent tissues or organs so as to slacken these, promote vascular and lymphatic absorption, and in this way bring about a more healthy condition of the local circulation and relief to the nerve pressure supposed to be exerted by the cicatricial tissues.

The originator of this form of treatment is a Swedish layman, Brandt, and his work was taken up by several German gynecologists, among whom were Schultze, Profanter, Schauta, and others.

Before going on more particularly to the question of indications, methods, and results, we may say that we believe there are great difficulties in the way of its general acceptance. The chief one is that it involves undue manipulation of the genital organs. This is a most serious objection, and one which will in all probability be fatal to the method. Then again the manipulation will be dangerous if the diagnosis be wrong—*e.g.*, if a pyosalpinx be chosen for it. There is thus every prospect of its being supplanted in the few cases requiring it by abdominal section.

Prolapsus uteri is one of the cases specially recommended for it. Here, however, it is difficult to understand how it does good, although trustworthy observers have recorded cases of cure.

Indications. Retroversion of uterus bound down by adhesions; adherent ovaries; parametritis posterior causing pathological anteflexion; prolapsus uteri.

Methods. In chronic inflammatory cases the patient occupies the dorsal posture, with knees well drawn up and dress freely loosened.

The gynecologist carefully ascertains bimanually the condition of the organs, and then, keeping the two fingers passed into the vagina fixed, he grasps or maps out by the outer hand the adhesions to be stretched, and by movement of the outer hand only, stretches these or exercises a rubbing movement on them. Rectal manipulation may be employed instead of vaginal. This bimanual massage should not be practised for more than a few minutes at each sitting, and the number of sittings must be left to the judgment of the gynecologist.

Schultze extended this method by advocating and practising, not mere stretching, but actual separation of the adhesions. For this purpose the patient is chloroformed, the condition accurately mapped out, and the adhesions then separated by bimanual manipulation. Schultze's results have been good, but it is evident that the risks in less experienced hands are very great.

In prolapsus uteri the method is more complicated and troublesome. Briefly it is as follows (*Profanter*).

(1) *Position of patient.* The patient has her dress thoroughly loosened and lies on a short couch (4 ft. × 2 ft. 8 in.) with her chest supported by cushions. In this way she is compelled to slacken the abdominal muscles as much as possible. An assistant passes his fingers into the vagina, replaces and anteflexes the uterus. The masseur then with both hands grasps the uterus and draws it up as far as possible.

The patient now raises the hips from the couch, thus supporting her body on elbows and feet, while the gynecologist forcibly separates her closed knees and then forcibly approximates them, the patient resisting each time. These manœuvres are repeated thrice.

The object of this so-called pelvic gymnastics is to bring into action the pelvic muscles (levator ani, obturator internus, perineal muscles) and thus strengthen the musculature and fascia of the pelvic floor.

The patient need not be confined to bed during the intervals of the treatment.

CASE-TAKING.

LITERATURE. *Emmet*—Gynecology, p. 57: London, 1880. *Simpson, A. R.*—Contributions to Obstetrics and Gynecology, Method of Case-Taking in Gynecology, p. 317.

It is of importance to give some hints as to case-taking or the investigation of cases of diseases of the female sexual organs.

In hospitals, some form of case-taking card is usually employed; and we describe the method of case-taking adopted by Professor Simpson in the Buchanan Ward (for the Diseases of Women) in the Edinburgh Royal Infirmary.

CASE-TAKING CARD.

ANAMNESIS.

1. Name; Age; Occupation; Residence; Married; Single; or Widow; Date of Admission.

2. Complaint and Duration of Illness.

3. General History of—(*a*) Present attack; (*b*) Previous Health; (*c*) Diathesis; (*d*) Social Condition and Habits; (*e*) Family health.

4. Sexual History.

(1) *Menstruation*—

A. Normal—(*a*) Date of Commencement; (*b*) Type; (*c*) Duration; (*d*) Quantity; (*e*) Date of Disappearance.

B. Morbid—(*a*) Amenorrhœa; (*b*) Menorrhagia; (*c*) Dysmenorrhœa.

(2) *Intermenstrual Discharge*—(*a*) Character; (*b*) Quantity.

(3) *Pareunia*.

(4) *Pregnancies*—(*a*) Number; (*b*) Dates of First and Last; (*c*) Abortions; (*d*) Character of Labours; (*e*) Puerperia; (*f*) Lactations.

5. Local Functional Disturbances—(*a*) Bladder; (*b*) Rectum; (*c*) Pelvic Nerves and Muscles.

6. General Functional Derangements—(*a*) Nervous System; (*b*) Respiratory System; (*c*) Circulatory System; (*d*) Digestive System; (*e*) Emunctories.

PHYSICAL EXAMINATION.

1. General Appearance and Configuration.

2. Mammæ.

3. Abdomen—(*a*) Inspection; (*b*) Palpation; (*c*) Percussion; (*d*) Auscultation; (*e*) Mensuration.

4. External Pudenda.

5. Per Vaginam—(*a*) Orifice; (*b*) Walls and cavity; (*c*) Roof; (*d*) Os and Cervix Uteri.

6. Bimanual Examination (Abdomino-vaginal, Recto-vaginal, Abdomino-rectal, Abdomino-recto-vaginal, Abdomino-vesico-vaginal)—

(1) *Uterus*—(*a*) Size; (*b*) Shape; (*c*) Consistence; (*d*) Sensitiveness; (*e*) Position; (*f*) Mobility; (*g*) Relations.

(2) *Fallopian Tubes*.

(3) *Ovaries*—(*a*) Size; (*b*) Situation; (*c*) Sensitiveness.

(4) *Peritoneum and Cellular Tissue*.

(5) *Bladder*. (6) *Rectum*. (7) *Pelvic Bones*.

7. Use of—(*a*) Speculum; (*b*) Volsella; (*c*) Sound; (*d*) Curette; (*e*) Aspiratory Needle; (*f*) Tent.

8. Physical Changes in—(*a*) Nervous, (*b*) Respiratory, (*c*) Circulatory, (*d*) Digestive Systems; (*e*) Emunctory Organs; (*f*) Skin; (*g*) Bones.

DIAGNOSIS.
PROGNOSIS.
TREATMENT.
PROGRESS AND TERMINATION.

We have drawn up a schedule[1] based on this card which will be found very convenient, either in private or in dispensary practice, for recording gynecological cases.

ANAMNESIS.

In taking the history of a case the first thing is to ascertain the patient's complaints. These vary much, but in minor cases are usually those of pain, increased menstruation, painful menstruation, leucorrhœa. The pain is usually sacral, iliac or left infra-mammary. A very important point is to ascertain the starting-point of the patient's illness, and in many cases it can be traced to labour, abortion, or some specific gonorrhœal attack. Not infrequently it has followed marriage. When menorrhagia is complained of, the amount of discharge, and whether clots or shreds are passed, should be noted; and if pain at the period is present, the time of its occurrence, whether before, during, immediately after the period, or between the periods should be ascertained. Bleeding after coitus is suspicious of malignant disease. The history of a case should be carefully taken, the patient cross-examined on obscure points, but her statement should always have full weight given to it, and should not be discounted. As a matter of fact the patient is a witness really, and can only have her evidence discarded if grossly improbable. In a case of suspected pregnancy for instance, the patient's statement, if made, that she has menstruated regularly is of the greatest importance, and must not be brushed aside without careful investigation. It may be that she has had a regular discharge, and this therefore should be specially inquired into. Queries under the head of pareunia should not be put unless special indications are present, or the patient volunteers a statement. It is important to note the diathesis—strumous, neurotic, tuberculous, gouty. The remaining facts to be ascertained under "Anamnesis" need no further comment.

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[1] Supplied by Messrs W. & A. K. Johnston, Ltd., Edinburgh, in separate sheets, or in book-form.

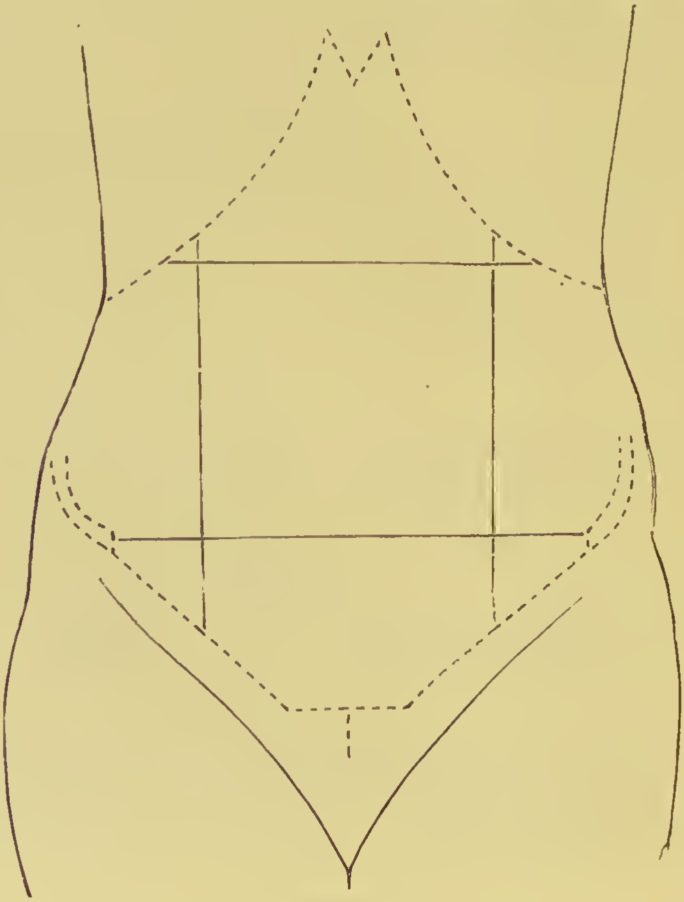

FIG. 356.

OUTLINE DIAGRAM OF ABDOMEN FOR RECORDING POSITION OF TUMOURS RELATIVE TO THE BODY LANDMARKS.

PHYSICAL EXAMINATION.

Abdominal Examination. The method has been already described (*v.* p. 92). Girth measurements should be made if necessary, and the routine inspection, palpation, etc., carefully done. This should then be checked by the following rapid methods.

The student has to consider in a case of abdominal distension the following points.

(1.) Is there any abnormal abdominal content?
(2.) Is it solid?
(3.) Is it fluid, and if so (*a*) encysted and intraperitoneal, or (*b*) encysted and extraperitoneal?
(4.) Is the fluid when present, free, or partially encysted?

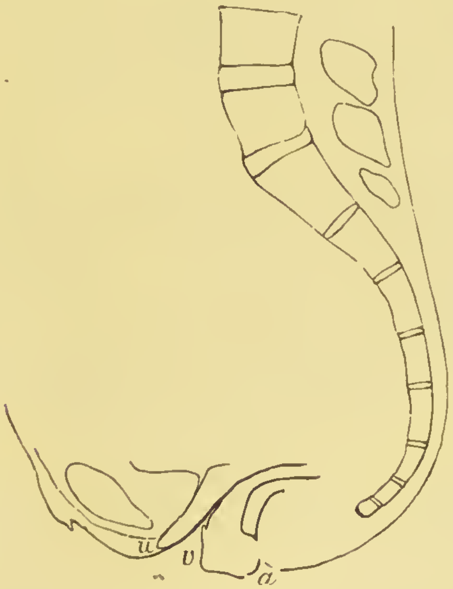

Fig. 357.

Outline Diagram of Pelvis for filling in position of Uterus or Tumours (*A. R. Simpson*).

In this way we do not consider special growths, but only some general conditions common to several.

(1.) *Is there any abnormal abdominal content?* This is best settled by percussion. A tympanitic note is evidence of the absence of any abnormal content of much size. This remark does not apply to small growths, and the examination must be supplemented by bimanual palpation with one hand behind and one in front, and also by the abdomino-vaginal bimanual.

(2.) *Is it solid?* We judge of this by touch. We say the tumour is solid, because it feels firm. Firmness must not be confounded with tension in a cystic tumour. The best type of solid tumour is the ordinary fibromyoma uteri.

(3.) *Is it fluid, and, if so, is it* (*a*) *encysted and intraperitoneal, or* (*b*) *encysted and extraperitoneal?* An encysted intraperitoneal tumour has tension, fluctuation (perfect in parovarian tumours, less so in ovarian), symmetrical dulness circular or oval in outline, not altering when the patient's posture is changed, and the *uterus lies usually below, and is not involved in the tumour*. This is best ascertained by recto-vaginal examination, and is a point of great value.

In the encysted extraperitoneal growth we have dulness, not altering when the patient changes her position, tension, *but the uterus is often lifted up: occasionally the large bowel* (*ascending or descending colon*) *is displaced towards the middle line.*

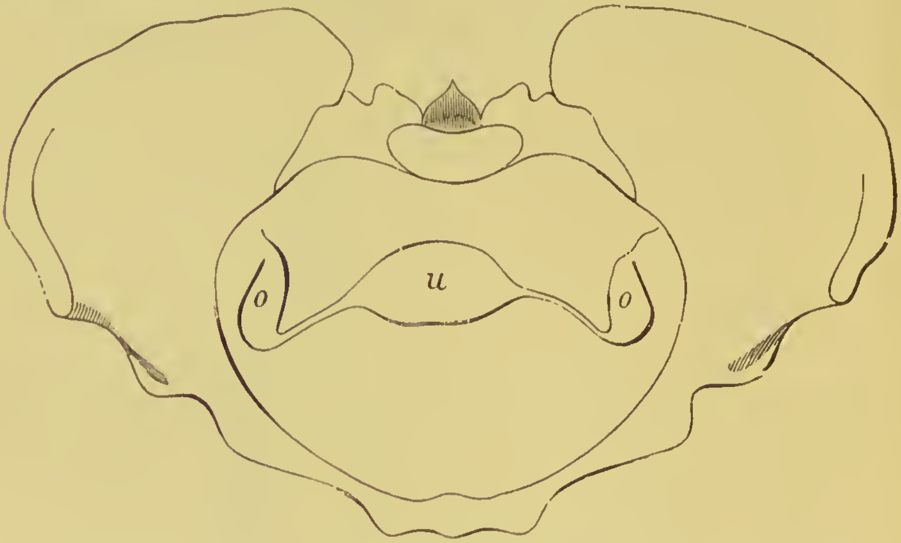

FIG. 358.
OUTLINE DIAGRAM PELVIS AS SEEN THROUGH THE BRIM, TO FILL IN POSITION OF TUMOURS RELATIVE TO UTERUS (*Schultze*).

(4.) *Is the fluid when present free or partially encysted?* Here we find on percussion, when patient is dorsal, a concave upper boundary to dulness (concavity pointing down), dulness at flanks and a fluctuating impulse. In the lateral posture the dull note is on the lower side only. When a large amount of free fluid is present, the extensive dulness may mislead.

Irregular dulness and less perfect change of note on change of posture mean irregular adhesion, and are suspicious of tuberculous and malignant disease. The student should keep in mind that a soft fibroid may simulate fluctuation even when touched directly, as is demonstrated at an abdominal section.

The student now proceeds to the *inspection of the genitals*, to the *vaginal examination* and the complete *bimanual* (*v.* Chap. VIII.), and from the facts he ascertains has to make up his mind as to diagnosis, prognosis, and treatment.

Many cases permit of accurate diagnosis, some only of an opinion as to their probable nature.

One special point to be kept in mind is that the commonest case in minor gynecology is one with multiple lesions, viz., laceration of the cervix, more or less pronounced, often a retroflexion with endometritis, and some varying amount of cellulitic, peritonitic or appendage thickening. The history is that this has followed abortion, childbirth, or marriage.

The mistake usually made is that of picking out one lesion and giving it undue prominence. The best reading of such cases is that of minor septic infection through the endometrium or cervix with the resultant secondary lesions already given, and treatment is not so much mere rectification of any displacement, but the treatment of the endometritis by curetting and subsequent attention to the inflammatory conditions by the use of the tampon, blisters, hot douche. In obstinate cases, operative removal of affected tubes and ovaries must be considered.

CLASSIFICATION OF DISEASES OF WOMEN.

As already explained, we have classified the diseases considered on an anatomical basis (p. 164).

The following table shows that they may be classified on a pathological basis, and is given here to show how far our knowledge has gone, and that many gaps in it have yet to be filled up.

We may group the diseases of gynecology under the heads of—

1. *Congestive: Vascular Ruptures.*
2. *Hypertrophy.*
3. *Atrophy.*
4. *Traumatism.*
5. *Simple inflammation.*
6. *Micro-organismal :*

    Acute and chronic infective { *A.* Due to known microbes still in tissues—
        1. Tuberculous,
        2. Gonorrhœal,
        3. Actinomycotic,
        4. Septic.

    Chronic infected { *B.* Due to microbes and their products, these causes having been apparently completely eliminated.

7. *Herniæ.*
8. *New Growths.*
9. *Developmental errors.*
10. *Neuroses.*

Almost all gynecological diseases can be grouped under these heads as in the following table :—

PATHOLOGICAL CLASSIFICATION OF DISEASES OF WOMEN.

I. CONGESTIVE : VASCULAR RUPTURE—

- (1.) Alleged simple congestion of genital tract (?).
- (2.) Pelvic hæmatocele.
- (3.) Pelvic hæmatoma.
- (4.) Ovarian apoplexy.

II. HYPERTROPHY—

- (1.) Hypertrophy of vaginal portion of cervix.
- (2.) „ middle portion.
- (3.) „ supravaginal portion.
- (4.) „ associated with lacerated cervix.
- (5.) Simple hypertrophy of organs.

III. ATROPHY—

- (1.) Atrophic Pelvic Peritonitis.
- (2.) Parametritis chronica atrophicans, circumscripta et diffusa.
- (3.) Superinvolution of uterus.
- (4.) Kraurosis vulvæ.
- (5.) Certain forms of pruritus vulvæ.
- (6.) Senile changes in organs.

IV. TRAUMATISM—

- (1). Cervical lacerations.
- (2). Vaginal lacerations.
- (3). Perineal, vestibular, and vulvar tears.

V. SIMPLE INFLAMMATIONS—

Alleged simple non-specific inflammatory conditions of all genital organs (?).

VI. MICRO-ORGANISMAL AND PARASITIC—

A. Acute and Chronic Infective Diseases—

1. Tuberculous disease of peritoneum, Fallopian tube, ovary, uterus, vagina, vulva.
2. Gonorrhœal inflammation of peritoneum, connective tissue, Fallopian tube, ovary, uterus, vagina, vulva, and its ducts. Pyosalpinx.
3. Actinomycosis of tube, ovary, and connective tissue.
4. Septic diseases: Acute peritonitis, cellulitis, oöphoritis, salpingitis, endometritis, metritis. Septic sources in cervix, vagina, vulva. Pyosalpinx. Hydrosalpinx.

B. Chronic Infected Diseases—

1. *A group of cases where we have multiple lesions;* usually some enlargement and displacement of the uterus, with various degrees of endometritis and thickenings of an inflammatory nature, either peritonitic, cellulitic, salpingitic, or oöphoritic; cervical splits are often present.
2. Pathological versions and flexions.
3. *A group with minor single inflammatory conditions* of ovary, tube, peritoneum, connective tissue; often associated with endometritis.

C. Parasitic—

1. Echinococci (tænia echinococci) in connective tissue, peritoneal cavity, uterus, ovary.
2. Parasitic skin diseases and pedicular irritation.

VII. HERNIÆ:

(1). Herniæ of uterus and appendages, singly or combined, into inguinal canal.

(2). Prolapsus uteri.

(3). Vaginal enterocele (anterior and posterior). Vulvar enterocele.

VIII. NEW GROWTHS:

A. Non-Malignant—

1. *Overgrowths of normal tissue,* with or without fluid or solid products.

(*a*) *Unstriped muscle.*—Fibro-myoma of round ligament, in broad ligament, of ovary, of uterus, of tube; fibrocystic of uterus; fibro-myomatous polypi—*vide* also (*d*).

(*b*) *Fibrous connective tissue and fat.*—Fibrous growths of round ligament, of ovary, of vagina. Lipomata of broad ligament, of vulva.

(*c*) *Glandular tissue*—

(1) Endometritis.

(2) Cystoma ovarii.

(3) Dermoids of ovary.

(4) Cervical and uterine polypi (mucous).

(5) Adeno-myoma of uterus.

(*d*) *Vascular elements.*—Fibroids of uterus—some forms *vide* (*a*). Endometritis fungosa.

B. Malignant—

1. *Sarcoma* of pelvic connective tissue; of round ligament; of tube; of ovary, uterus, vagina, and vulva.
2. *Carcinoma* of ovary, peritoneum, tube, uterus, vagina, and vulva; combinations.
3. *Deciduoma malignum.*

C. Growths due to Evolutionary Relics—

(*a*) *To morbid development of Graafian follicles.*—Cystic and dermoid ovary.
(*b*) *To remains of Wolffian body and duct, or to morbid development of germ epithelium.*—Parovarian and papillomatous tumours;[1] some broad ligament cysts;[1] some vaginal and cervical cysts.
(*c*) *To undue development of ovarian fossa.*—Ovarian hydrocele.

IX. DISPLACEMENTS OF UTERUS:

(1) Inversion of uterus—*vide* (VI.) Group *B*, and (VII.).

X. DEVELOPMENTAL ERRORS:

(1) Malformations in peritoneal folds; of ovary, tube, uterus, vagina, vulva. Hermaphroditism.
(2) Round ligament hydrocele.
(3) Allantoic cysts.
(4) Hæmatosalpinx, hæmatometra, hæmatocolpos. Some forms of tubal distension. Hydrosalpinx.

XI. NEUROSES:—

Hysteria; hystero-epilepsy; neurasthenia (we may have also neurotic symptoms, viz., reflex pains, some forms of dysmenorrhœa; menorrhagia).

In *B* of section VI., under the micro-organismal group, or what we have termed *chronic infected cases*, we have really the majority of the chronic diseases coming continually under the notice of the practitioner and specialist. It is on this group that so much theory and energy have been spent, in the attempt to get at the nature of the associated lesions, and to cure the discharges, aches, discomfort, and disturbance of function they give rise to. The *A* and *B* groups are really one, but are sharply contrasted, as in the former we have the exact scientific pathology; in the latter, dreary speculative theories, where one does not dig long without coming, in Carlyle's phrase, to water. Group *B* is the dust-heap of Gynecology, where valuables lie hid and obscured.

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[1] Often malignant.

The view of such cases that we wish to urge is this. Many are the result of a previous septic attack, minor or major. The source of infection has been the cervical laceration or the endometrium bared by abortion or labour, and the invasion of the micrococci along mucous membrane or through lymph spaces has been met by the ever-watchful tissue elements; the invaders have been captured; and in the cellulitic thickenings, or in those of the tubes and ovary found lasting for months and years after the primary attack, one has the tumuli, as it were, that mark the old battlefield. Gradually, as these thickenings shrink, we get uterine displacements, nerve pressure, cervical ectropium, and hypertrophy, the stock cases of gynecology.

SOURCES OF GYNECOLOGICAL LITERATURE.

At the beginning of each subject we have already given a summary of the literature to which we were indebted, and numerous references will be found in footnotes throughout the book. The literature given, therefore, represents what we considered important, and what we had in most cases personally studied.

Gynecological Literature is so extensive that a full resumé of it would have occupied several times the space we have allotted to the whole subject. We wish, however, to point out here the sources, so that any practitioner who wishes to ascertain the best books and monographs on any special subject may know how and where to begin his search.

The sources of Gynecological Literature are threefold:—

I. Catalogues, Dictionaries;
II. The larger Text-Books of Gynecology;
III. Articles and Abstracts in the various Gynecological quarterlies, monthlies, and weeklies, with Retrospects and Jahrbücher.

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Menstruation and its Disorders—*W. Gill Wylie.*
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In looking up literature on any special subject, first consult the literature given at the beginning of each chapter. The list of literature given in Veit's Handbuch, the Index Medicus, Neale's Digest and the U.S.A. Index Catalogue may also be consulted with advantage. The various Retrospects and Jahrbücher mentioned above give abstracts of the papers, and the French and German Cyclopædias give special exhaustive articles on each subject.

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Note.—As the student will find in the *Table of Contents* the sub-divisions of each special subject, we give only one reference—in bold figures—to the places where each subject is specially treated of. References in other parts of the book are given in detail.

Thus, for the topics considered under "Carcinoma Uteri," see that subject in the *Table of Contents*; for references to Carcinoma, not contained in the chapters on Carcinoma, see Index.

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